Odor Management Plan

Bristol Quarry Landfill (SWP 588)

2100192

June 7, 2021

Integrated Solid Waste Management Facility
2655 Valley Drive
Bristol, Virginia 24201

Draper Aden Associates
Engineering • Surveying • Environmental Services

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

This Odor Management Plan (OMP) has been prepared pursuant to the Virginia Department of Environmental Quality's (DEQ's) letter dated January 11, 2021. The OMP was developed based DEQ's Submission Instruction 13, Landfill Gas Management, Remediation, and Odor Plans for Solid Waste Disposal Facilities. In late January 2021 and prior to submission of the OMP, DEQ requested that a separate Air Monitoring Plan be prepared. The Air Monitoring Plan addressed air sampling activities. In February 2021, DEQ requested that the Air Monitoring Plan's name be changed to Odor Complaint Response Plan (OCRP). The Air Monitoring Plan/OCRP was incorporated by reference in the OMP. However, in April 2021, DEQ requested that the OCRP be incorporated into the OMP. The OCRP has been incorporated into this OMP as Appendix C.

1.1 Background

The Integrated Solid Waste Management Facility (ISWMF) is an active solid waste facility owned and operated by the City of Bristol, Virginia. The ISWMF has three landfill units within its property boundary. The first landfill unit (Permit No. 221) is closed and capped. The second landfill unit (Permit No. 498) is currently being mined in order to recover airspace for potential future use as a construction and demolition debris (CDD) landfill. Mined materials are disposed in the active landfill. The third landfill unit (Permit No. 588) is an active landfill that commenced operation in March 1998. Landfill gas collection systems are installed in each of the three landfills.

1.2 Summary of Odor Complaints

The ISWMF began receiving multiple odor complaints in late October 2020.

Complaints have typically been received when there is little wind and are generally from neighborhoods to the north of the landfill and to the south and southwest in Tennessee.

1.3 Immediate Actions in Response to Odor Complaints

Immediate actions taken in response to the odor complaints have included:

- ISWMF personnel have driven through neighborhoods to assess odors.

- In December 2020, ISWMF personnel began monitoring offsite locations to screen for typical landfill gas (LFG) constituents such as methane and hydrogen sulfide.
- In December 2020, The City began working with SCS Field Services to design and construct upgrades to the LFG collection system in the Permit 588 landfill. The upgrades include new horizontal collection wells and collection piping. The construction is ongoing as of February 2021.
- In January 2021, additional cover soils were placed on inactive areas of the Permit 588 landfill and the size of the working face was minimized.
- In early January 2021, ambient air was pumped into the gradient water/leachate pump station of the Permit 588 landfill. This was done to reduce anaerobic conditions in the pump station that may contribute to odors.
- On January 10, 2021, ISWMF personnel collected two air samples from locations with odors. The samples were analyzed for volatile organic compounds (method TO-15). No specific compounds that could be causing the odors were identified from this sampling event.

2.0 **ODOR CONTACT**

Odor complaints may be made to one of the ISWMF's Odor Contacts noted below:

1. Solid Waste Disposal Manager

   Email: sam.hess@bristolva.org
   Phone: 276-645-7380
   Fax: 276-591-5237
   Address: 2655 Valley Drive, Bristol, VA 24201

2. Public Works Director

   Email: wallace.mcculloch@bristolva.org
   Phone: 276-645-7360
   Fax: 276-645-7235
   Address: 2103 Shakesville Road, Bristol, VA 24201

Complainants have been using Facebook and other online applications to register complaints. However, these websites are not official locations for submitting odor complaints and are not monitored on a regular basis. To organize and centralize odor complaints, ISWMF personnel will post that official complaints need to be made to the Odor Contact.

3.0 HANDLING ODOR COMPLAINTS

The ISWMF plans to handle complaints as noted below.

3.1 Documentation of Odor Complaints

Upon receipt of a complaint (via phone, email, or letter), the Odor Contact or other ISWMF staff will document complaints on a form (see Appendix A for an example form) for future reference. Hard copies of email and letter complaints will be attached to the completed form.

Odor complaint forms and other documentation shall be maintained on-site for a minimum of five years.

3.2 Investigation of Odor Complaints

Once a complaint is received, ISWMF personnel will investigate as follows:

- Monitor the area of the complaint in accordance with the ISWMF's Odor Complaint Response Plan (see Appendix C).
- Consult with other ISWMF personnel to see if operations (including new waste types/streams) may have changed or equipment malfunctioned in the timeframe of the complaint.
- Conduct an inspection of the ISWMF to evaluate where odors may be present on site and ascertain if systems and equipment (such as the LFG collection system) are working correctly.
- Notify DEQ of the complaint or complaints in accordance with the Odor Complaint Response Plan (see Appendix C).
- Conduct remedial actions as needed. See Section 4.0, below for possible actions.
- Follow up with the complainant or complainants within five (5) business days of when the complaint was received. Provide the complainant a summary of the investigative and remedial work completed to date and, as applicable, additional remedial actions planned. Follow up may be via phone, email, or letter.
- Complete follow-up and corrective measures portions of the odor complaint form and attach any follow-up correspondence.

4.0 **REMEDIAL MEASURES**

Depending on the source of the odor, the following are remedial actions that could be taken within a few days of an odor complaint:

- Install intermediate cover or increase the thickness of daily cover in the Permit 588 landfill.
- Reduce the size of the working face.
- Perform minor repairs on the existing LFG collection system to increase vacuum within the landfill.
- Increase dewatering of the LFG extraction wells to increase vacuum within the landfill.
- Pump ambient air into the leachate pump station (Permit 588) to minimize anaerobic conditions.
- Repair leachate seeps.
- Stop or reduce the disposal of waste streams that may be causing particular odors.
- Closing and/or sealing manhole covers and access doors related to the leachate and gradient water collection and conveyance systems.

Additionally, the City may consider the following remedial actions that would require a longer schedule to implement:

- Install additional LFG extraction wells and/or collection system piping to increase the volume of LFG collected and vacuum within in the landfill(s).
- Install odor masking or neutralizing systems in strategic locations along the perimeter of individual landfills and/or property boundary.
- Treatment of gradient water and/or leachate before the liquids leave the ISWMF property. Treatment could include air stripping of the liquids, aeration, the addition of neutralizing chemicals to the liquid, and/or extracting air from the sewer pipe and flaring the collected gases.

5.0 **ANNUAL REVIEW**

At a minimum, the OMP will be reviewed by ISWMF personnel on an annual basis to evaluate whether the procedures herein need to be updated. If revisions are made to the OMP, then the title page shall be changed to reflect the new date of the OMP, so that the latest version is more easily identifiable.

Each time revisions are made to the OMP and after each annual review (regardless of whether revisions are made), the event will be a logged and filed with the OMP. A log form is provided in Appendix B.

Also, a certification by the ISWMF's responsible official will be completed with finalization of the initial OMP and after each revision/review. The certification shall be, or similar to, the following:

> I certify that this document and all attachments were prepared under my direction or supervision, the document meets the standards of the Virginia Solid Waste Management Regulations (9VAC20-81).
>
> Responsible Official Name (Print): _____
>
> Signature: _____
>
> Date: _____

The completed certifications will be included in Appendix B along with the completed log. Logs and certifications will be maintained for at least five (5) years.

APPENDIX A
Forms

ODOR COMPLAINT FORM

FACILITY NAME: Integrated Solid Waste Management Facility **DATE:**_____

FACILITY ADDRESS: 2655 Valley Road **TIME:**_____
Bristol, Virginia 24201

RECEIVED BY:_____

Contact Information of Caller
Name:_____
Address:

Phone:_____
Email:_____

Odor Information
Date Detected:_____
Time Detected:_____
Location Detected:

Description of Complaint

Type of Odor:_____
Intensity of Odor:_____
Weather Conditions when odor was detected:_____
Weather Conditions at the time odors were detected (based on weather monitoring station or internet resources):

Wind Direction & Speed:_____ Rainfall:_____ Temperature:_____
Barometric Pressure:_____ Humidity:_____

Have odors been noticed at this location in the past?_____
If so, when? _____

Follow-up Contact with Caller
Was follow-up contact made with the caller?_____
If yes, answer the following questions:

When was contact made? Date: _____ Time: _____

Who made contact?_____

How was contact made? (Letter, Phone Call, E-mail, etc.)_____

What issues were discussed with the caller?_____

_____

Description of Corrective Measures:

_____

_____

_____

_____

_____

_____

_____

_____

_____

APPENDIX B
Review Log and Certification

Review Log

Review Date	Revisions Made (if any)

APPENDIX C
Odor Complaint Response Plan

Odor Complaint Response Plan

Bristol Quarry Landfill (SWP 588)

B11145B-14D

June 7, 2021

Integrated Solid Waste Management Facility
2655 Valley Drive
Bristol, Virginia 24201

Draper Aden Associates
Engineering • Surveying • Environmental Services

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

In late October 2020, the City of Bristol Virginia began receiving odor complaints. Odors and subsequent complaints have continued over the last few months. To assess the City of Bristol's response to these odors, DEQ (in an email dated January 28, 2021) requested that the Integrated Solid Waste Management Facility (ISWMF) provide an air monitoring plan.

In response to DEQ's request, a draft air monitoring plan was prepared to outline the plan for sampling ambient air beyond the boundaries of the ISWMF as part of the City's on-going efforts to respond to odor complaints. In an email dated February 18, 2021, DEQ requested that the plan's name be changed to "odor complaint response plan" in addition to several other suggestions. The name was changed for the March 8. 2021 version of the plan.

1.1 Previous Monitoring Efforts

Since December 2020, the City has been monitoring air at offsite areas. Using a GEM 5000 and MSA ALT Air 4x hazardous gas meter, the City has been screening for methane, carbon monoxide and hydrogen sulfide at those offsite locations. A summary of the screening activities is provided in Appendix 1.

On January 10, 2021, the City collected two grab samples of air in Summa canisters. Both samples were collected in locations that had odors at the time of collection; one sample was collected on Shakesville Road near the entrance to the ISWMF and the other was taken at the corner of Maryland Avenue and Poplar Street (Tennessee). Both samples were analyzed for volatile organic compounds via EPA Method TO-15. Results are provided in Appendix 1. Several organic compounds were detected, but none at hazardous levels or at levels that would indicate or cause an odor problem.

1.2 Migration Potential

Odors are likely to migrate offsite via wind transmission and, due to various mechanisms such as temperature gradients, flow to low points in the terrain.

Prevailing winds in Bristol are generally to the east. Most of the area to the east of the ISWMF is forested. However, there are houses located to the northeast of the ISWMF along Pendergrass Road. These houses could potentially receive odors on windy days.

Four stream valleys adjacent to the ISWMF could provide low spots and corridors for off-site migration of the odors. One stream, a tributary of Beaver Creek, flows northwest to west of the ISWMF. This stream valley slopes down towards the Kingtown area of the City. A stream runs generally west from the ISWMF along the state line and slopes down toward the northern portion of the Fairmount area. Another stream runs southwest into Tennessee with this stream valley sloping down towards the King College and Fairmount areas. A fourth stream is located east of the ISWMF and flows southeast into Tennessee towards Middlebrook Lake. This Lake and the areas noted above all have the potential to receive odors from the ISWMF.

A site map is provided in Appendix 2 to illustrate the ISWMF and potential odor migration routes.

In addition to the typical migration mechanisms noted above, the ISWMF discharges their leachate and gradient water (groundwater that is pumped to maintain a separation from the landfill liner system) to a sanitary sewer. The sewer exits on the west side the ISWMF and then is conveyed to the Bristol, Tennessee wastewater treatment plant located approximately 14 miles southwest of the ISWMF. The ISWMF is currently involved in groundwater corrective action and constituents of concern, such as benzene, are collected in the gradient control system. Constituents from the gradient water or leachate discharged to the sanitary sewer could volatilize and create odors around sewer manholes or unsealed pipes and access points.

2.0 MONITORING

If an odor complaint is received (directly from the complainant) by ISWMF staff (specifically the point of contact listed in the odor management plan) in a given month, then odor monitoring will be conducted as noted below. ISWMF staff are anticipated to conduct monitoring, but they may designate a third party to conduct sampling.

2.1 Location

Monitoring will be conducted within the neighborhood from which the complaint is received. If a complainant provides a specific address, ISWMF staff will monitor at the address. Monitoring may also be conducted in neighborhoods or other areas that have had previous odor issues and/or in areas where the potential for odor migration is considered high.

Monitoring will be conducted at the street curb or on a sidewalk. Private property will not be accessed.

2.2 Frequency

Once a complaint is received, monitoring will be conducted for up to three (3) nights a week for two weeks. Staff may elect to monitor during weather conditions that could lead to odors. If a specific odor complaint including a street address is received, ISWMF staff intends to respond to the location while the odor is still occurring (within two hours of the complaint) dependent on staff availability and total number of complaints.

Complaint calls made after normal business hours will be collected via a voicemail system. The messages will be listened to during the next morning and callers will be contacted for follow-up discussion.

Monitoring will generally be conducted within the hours of 6 am to 11 pm and may include weekends. Holidays are excluded.

2.3 Sampling and Analysis

At each sampling location, ISWMF staff will smell for general odors, and ambient air will be screened using a GEM 5000 and a MSA ALT Air 4x hazardous gas meter, or similar equipment. During the

screening measurements of percentage methane (by volume of air) and concentration of hydrogen sulfide (ppm) will be collected along with percentage of oxygen, percentage of nitrogen and concentration of carbon monoxide (ppm).

If ISWMF staff perceive that odors detected by smell are from the ISWMF and/or methane or hydrogen sulfide are detected at a sampling location, then ISWMF staff may choose to collect a grab sample of ambient air using a Summa canister.

For complaints made after normal business hours, sampling (if needed) will be conducted during the next day.

Composite samples (e.g., 8-hour or 24-hour) will not be collected for off-site samples. Composites samples are susceptible to tampering, require permission to place on private property, and are susceptible to loss of vacuum that would invalidate the results.

Summa canister samples will be sent to a laboratory for analysis using EPA Method TO-15, Determination of Volatile Organic Compounds in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry. At least a 14-days turnaround will be requested so that results will be available before the monthly report (discussed in Section 3.2) is prepared.

On-Site Sampling

Starting on March 20, 2021, the City will conduct baseline sampling at the landfill. The baseline sampling will include monthly, 24-hour composite air samples for a period of three months (3 samples total). The composite air samples will be collected in Summa canisters and will be collected from the same location in the southwestern portion of the landfill property. A figure is provided in Appendix 2 denoting the approximate sample location. Samples will be sent to a laboratory for analysis using EPA Method TO-15.

Additional on-site sampling may be conducted at the discretion of the City.

3.0 REPORTING

3.1 Field Observations

During each sampling event, an air monitoring form will be completed. An example of the air monitoring form is provided in Appendix 3; this form or a similar form will be used to document sampling events. Information to include on the form will be:

- Sampling date.
- Ambient temperature.
- Barometric pressure (including a note whether the pressure was falling or rising during the timeframe of the monitoring).
- Weather conditions.
- Person(s) conducting the monitoring.
- Location of sampling (e.g., street address or intersection).
- Results of GEM monitoring.
- Results of MSA monitoring.
- Summa canister collection information (such as CAS numbers, chemical names).
- Comments on odors detected by smell, observations of surrounding area that may affect odors (e.g., open burning).

Appropriate chain of custody information will be provided for samples (e.g., Summa canisters) sent to a laboratory.

Monitoring equipment will be field calibrated in accordance with manufacturer's information. Calibration procedures are provided in Appendix 4. Calibration form examples are provided in Appendix 3.

3.2 Report

A report in letter format will be prepared for each month. In the event there are no sampling events in a given month, no letter will be prepared. For months with sampling (from February 2021 onward), the letter report will include:

- A summary of the complaints that lead to the sampling events.
- A summary of each sampling event.
- A discussion of results from sampling events.
- Recommendations for future actions.
- Attachments with the odor complaints, field observation forms, and test results from the month.

Reports will be prepared by the end of the month proceeding the reporting month (e.g., a report for February will be prepared by March 31st).

DEQ Notification

ISWMF staff will notify DEQ via email on a weekly basis of odor complaints where the complaint has provided contact information and an address.

3.3 Recordkeeping

Reports will be kept at the ISWMF for a minimum of three years from the date on the report. Reports will be accessible to regulatory agencies by request.

APPENDIX 1
Monitoring Data

Odor Complaint Monitoring Form
City of Bristol, Virginia
Integrated Solid Waste Management Facility

						GEM 5000			MSA Alt Air 4X				Draeger Tube	Summa Canister
Date	Time	Location	Temp (F)	Wind Dir.	Wind Sp. (mph)	CH4 %	O2 %	Bal. %	O2 %	LEL %	CO ppm	H2S ppm	Ammonia ppm	Collected (Y/N)
12/21/2020	7:05 PM	Booher Road	37	W	5	0	0	20.8	N/A	N/A	N/A	N/A	N/A	N
12/21/2020	7:07 PM	Booher Road TN Side	37	W	5	0	0	20.7	N/A	N/A	N/A	N/A	N/A	N
12/21/2020	7:10 PM	Robins Meadow Lane	37	W	5	0	0	20.8	N/A	N/A	N/A	N/A	N/A	N
12/21/2020	7:14 PM	Hunters Crossing	37	W	5	0	0	20.8	N/A	N/A	N/A	N/A	N/A	N
12/21/2020	7:18 PM	Robin Rd Bottom	37	W	5	0	0	20.8	N/A	N/A	N/A	N/A	N/A	N
12/21/2020	7:20 PM	Robin Rd Top of hill	37	W	5	0	0	20.8	N/A	N/A	N/A	N/A	N/A	N
12/21/2020	7:22 PM	Robin Rd at the Sparkling Brook Drive intersection	37	W	5	0	0	20.8	N/A	N/A	N/A	N/A	N/A	N
12/21/2020	7:24 PM	Sparkling Brook Drive East	37	W	5	0	0	20.8	N/A	N/A	N/A	N/A	N/A	N
12/21/2020	7:27 PM	Sparkling Brook Drive Center	37	W	5	0	0	20.8	N/A	N/A	N/A	N/A	N/A	N
12/21/2020	7:30 PM	Sparkling Brook Drive West	37	W	5	0	0	20.8	N/A	N/A	N/A	N/A	N/A	N
12/21/2020	7:35 PM	Mokingbird Rd Beginning	37	W	5	0	0	20.8	N/A	N/A	N/A	N/A	N/A	N
12/21/2020	7:37 PM	Mokingbird Rd Middle	37	W	5	0	0	20.8	N/A	N/A	N/A	N/A	N/A	N
12/21/2020	7:40 PM	Mokingbird Rd End	37	W	5	0	0	20.8	N/A	N/A	N/A	N/A	N/A	N
12/21/2020	7:44 PM	Cardinal Lane	37	W	5	0	0	20.8	N/A	N/A	N/A	N/A	N/A	N
12/21/2020	7:48 PM	Spanish oak road South	37	W	5	0	0	20.8	N/A	N/A	N/A	N/A	N/A	N
12/21/2020	7:50 PM	Spanish Oak Road Middle	37	W	5	0	0	20.7	N/A	N/A	N/A	N/A	N/A	N
12/21/2020	7:52 PM	Spanish Oak Road North	37	W	5	0	0	20.7	N/A	N/A	N/A	N/A	N/A	N
12/21/2020	8:01 PM	Oak Forst Drive	37	W	5	0	0	20.7	N/A	N/A	N/A	N/A	N/A	N
12/21/2020	8:03 PM	Forest Hills Drive South	37	W	5	0	0	20.7	N/A	N/A	N/A	N/A	N/A	N
12/21/2020	8:06 PM	Forest Hills Drive Middle	37	W	5	0	0	20.7	N/A	N/A	N/A	N/A	N/A	N
12/21/2020	8:08 PM	Forest Hills Drive North	37	W	5	0	0	20.7	N/A	N/A	N/A	N/A	N/A	N
12/21/2020	8:12 PM	Wood Side Drive	37	W	5	0	0	20.7	N/A	N/A	N/A	N/A	N/A	N
12/21/2020	8:17 PM	Edgefield RD	37	W	5	0	0	20.7	N/A	N/A	N/A	N/A	N/A	N
12/22/2020	7:10 PM	Florida Ave North	36	Calm	0	0	0	20.7	N/A	N/A	N/A	N/A	N/A	N
12/22/2020	7:14 PM	Florida Ave Middle	36	Calm	0	0	0	20.7	N/A	N/A	N/A	N/A	N/A	N
12/22/2020	7:18 PM	Florida Ave South	36	Calm	0	0	0	20.7	N/A	N/A	N/A	N/A	N/A	N
12/22/2020	7:28 PM	Georgia Ave North	36	Calm	0	0	0	20.8	N/A	N/A	N/A	N/A	N/A	N
12/22/2020	7:24 PM	Georgia Ave Middle	36	Calm	0	0	0	20.7	N/A	N/A	N/A	N/A	N/A	N
12/22/2020	7:20 PM	Georgia Ave South	36	Calm	0	0	0	20.7	N/A	N/A	N/A	N/A	N/A	N
12/22/2020	7:34 PM	Maryland Ave North	36	Calm	0	0	0	20.6	N/A	N/A	N/A	N/A	N/A	N
12/22/2020	7:37 PM	Maryland Ave Middle	36	Calm	0	0	0	20.7	N/A	N/A	N/A	N/A	N/A	N
12/22/2020	7:40 PM	Maryland Ave South	36	Calm	0	0	0	20.7	N/A	N/A	N/A	N/A	N/A	N
12/22/2020	7:50 PM	Carolina Ave North	36	Calm	0	0	0	20.8	N/A	N/A	N/A	N/A	N/A	N
12/22/2020	7:47 PM	Carolina Ave Middle	36	Calm	0	0	0	20.8	N/A	N/A	N/A	N/A	N/A	N
12/22/2020	7:44 PM	Carolina Ave South	36	Calm	0	0	0	20.8	N/A	N/A	N/A	N/A	N/A	N
12/22/2020	7:56 PM	Taylor St	36	Calm	0	0	0	20.8	N/A	N/A	N/A	N/A	N/A	N
12/22/2020	8:04 PM	Polar St	36	Calm	0	0	0	20.8	N/A	N/A	N/A	N/A	N/A	N
12/22/2020	8:10 PM	Spruce	36	Calm	0	0	0	20.8	N/A	N/A	N/A	N/A	N/A	N
12/22/2020	8:18 PM	Cypress St	36	Calm	0	0	0	20.8	N/A	N/A	N/A	N/A	N/A	N
12/22/2020	8:22 PM	Maple St	36	Calm	0	0	0	20.7	N/A	N/A	N/A	N/A	N/A	N
12/22/2020	8:30 PM	Chesnut St	36	Calm	0	0	0	20.7	N/A	N/A	N/A	N/A	N/A	N
12/23/2020	7:02 PM	Booher Road	51	SSE	8	0	0	20.6	N/A	N/A	N/A	N/A	N/A	N

Odor Complaint Monitoring Form
City of Bristol, Virginia
Integrated Solid Waste Management Facility

						GEM 5000			MSA Alt Air 4X				Draeger Tube	Summa Canister
Date	Time	Location	Temp (F)	Wind Dir.	Wind Sp. (mph)	CH4 %	O2 %	Bal. %	O2 %	LEL %	CO ppm	H2S ppm	Ammonia ppm	Collected (Y/N)
12/23/2020	7:04 PM	Booher Road TN Side	51	SSE	8	0	0	20.6	N/A	N/A	N/A	N/A	N/A	N
12/23/2020	7:08 PM	Robins Meadow Lane	51	SSE	8	0	0	20.6	N/A	N/A	N/A	N/A	N/A	N
12/23/2020	7:12 PM	Hunters Crossing	51	SSE	8	0	0	20.6	N/A	N/A	N/A	N/A	N/A	N
12/23/2020	7:16 PM	Robin Rd Bottom	51	SSE	8	0	0	20.6	N/A	N/A	N/A	N/A	N/A	N
12/23/2020	7:18 PM	Robin Rd Top of hill	51	SSE	8	0	0	20.6	N/A	N/A	N/A	N/A	N/A	N
12/23/2020	7:21 PM	Robin Rd at the Sparkling Brook Drive intersection	51	SSE	8	0	0	20.6	N/A	N/A	N/A	N/A	N/A	N
12/23/2020	7:23 PM	Sparkling Brook Drive East	51	SSE	8	0	0	20.6	N/A	N/A	N/A	N/A	N/A	N
12/23/2020	7:25 PM	Sparkling Brook Drive Center	51	SSE	8	0	0	20.6	N/A	N/A	N/A	N/A	N/A	N
12/23/2020	7:27 PM	Sparkling Brook Drive West	51	SSE	8	0	0	20.8	N/A	N/A	N/A	N/A	N/A	N
12/23/2020	7:58 PM	Mokingbird Rd Beginning	51	SSE	8	0	0	20.8	N/A	N/A	N/A	N/A	N/A	N
12/23/2020	8:01 PM	Mokingbird Rd Middle	51	SSE	8	0	0	20.8	N/A	N/A	N/A	N/A	N/A	N
12/23/2020	8:04 PM	Mokingbird Rd End	51	SSE	8	0	0	20.8	N/A	N/A	N/A	N/A	N/A	N
12/23/2020	8:08 PM	Cardinal Lane	51	SSE	8	0	0	20.8	N/A	N/A	N/A	N/A	N/A	N
12/23/2020	7:29 PM	Spanish oak road South	51	SSE	8	0	0	20.7	N/A	N/A	N/A	N/A	N/A	N
12/23/2020	7:31 PM	Spanish Oak Road Middle	51	SSE	8	0	0	20.7	N/A	N/A	N/A	N/A	N/A	N
12/23/2020	7:33 PM	Spanish Oak Road North	51	SSE	8	0	0	20.7	N/A	N/A	N/A	N/A	N/A	N
12/23/2020	7:35 PM	Oak Forst Drive	51	SSE	8	0	0	20.7	N/A	N/A	N/A	N/A	N/A	N
12/23/2020	7:37 PM	Forest Hills Drive South	51	SSE	8	0	0	20.7	N/A	N/A	N/A	N/A	N/A	N
12/23/2020	7:39 PM	Forest Hills Drive Middle	51	SSE	8	0	0	20.7	N/A	N/A	N/A	N/A	N/A	N
12/23/2020	7:42 PM	Forest Hills Drive North	51	SSE	8	0	0	20.7	N/A	N/A	N/A	N/A	N/A	N
12/23/2020	7:47 PM	Wood Side Drive	51	SSE	8	0	0	20.6	N/A	N/A	N/A	N/A	N/A	N
12/23/2020	7:52 PM	Edgefield RD	51	SSE	8	0	0	20.8	N/A	N/A	N/A	N/A	N/A	N
1/20/2021	7:11 PM	Booher Road	35	SSW	8	N/A	N/A	N/A	20.8	0	0	0	N/A	N
1/20/2021	7:14 PM	Booher Road TN Side	35	SSW	8	N/A	N/A	N/A	20.8	0	0	0	N/A	N
1/20/2021	7:18 PM	Robins Meadow Lane	35	SSW	8	N/A	N/A	N/A	20.8	0	0	0	N/A	N
1/20/2021	7:23 PM	Hunters Crossing	35	SSW	8	N/A	N/A	N/A	2.06	0	0	0	N/A	N
1/20/2021	7:25 PM	Robin Rd Bottom	35	SSW	8	N/A	N/A	N/A	20.8	0	0	0	N/A	N
1/20/2021	7:28 PM	Robin Rd Top of hill	35	SSW	8	N/A	N/A	N/A	20.8	0	0	0	N/A	N
1/20/2021	7:31 PM	Robin Rd at the Sparkling Brook Drive intersection	35	SSW	8	N/A	N/A	N/A	20.8	0	0	0	N/A	N
1/20/2021	7:35 PM	Sparkling Brook Drive East	35	SSW	8	N/A	N/A	N/A	20.8	0	0	0	N/A	N
1/20/2021	7:37 PM	Sparkling Brook Drive Center	35	SSW	8	N/A	N/A	N/A	20.7	0	0	0	N/A	N
1/20/2021	7:40 PM	Sparkling Brook Drive West	35	SSW	8	N/A	N/A	N/A	20.8	0	0	0	N/A	N
1/20/2021	8:21 PM	Mokingbird Rd Beginning	35	SSW	8	N/A	N/A	N/A	20.8	0	0	0	N/A	N
1/20/2021	8:24 PM	Mokingbird Rd Middle	35	SSW	8	N/A	N/A	N/A	20.8	0	0	0	N/A	N
1/20/2021	8:27 PM	Mokingbird Rd End	35	SSW	8	N/A	N/A	N/A	20.8	0	0	0	N/A	N
1/20/2021	7:42 PM	Cardinal Lane	35	SSW	8	N/A	N/A	N/A	20.8	0	0	0	N/A	N
1/20/2021	7:45 PM	Spanish oak road South	35	SSW	8	N/A	N/A	N/A	20.7	0	0	0	N/A	N
1/20/2021	7:49 PM	Spanish Oak Road Middle	35	SSW	8	N/A	N/A	N/A	20.8	0	0	0	N/A	N
1/20/2021	7:52 PM	Spanish Oak Road North	35	SSW	8	N/A	N/A	N/A	20.8	0	0	0	N/A	N
1/20/2021	7:56 PM	Oak Forst Drive	35	SSW	8	N/A	N/A	N/A	20.8	0	0	0	N/A	N
1/20/2021	8:01 PM	Forest Hills Drive South	35	SSW	8	N/A	N/A	N/A	20.8	0	0	0	N/A	N
1/20/2021	8:05 PM	Forest Hills Drive Middle	35	SSW	8	N/A	N/A	N/A	20.8	0	0	0	N/A	N

Odor Complaint Monitoring Form
City of Bristol, Virginia
Integrated Solid Waste Management Facility

						GEM 5000			MSA Alt Air 4X				Draeger Tube	Summa Canister
Date	**Time**	**Location**	**Temp (F)**	**Wind Dir.**	**Wind Sp. (mph)**	**CH4 %**	**O2 %**	**Bal. %**	**O2 %**	**LEL %**	**CO ppm**	**H2S ppm**	**Ammonia ppm**	**Collected (Y/N)**
1/20/2021	8:09 PM	**Forest Hills Drive North**	35	SSW	8	N/A	N/A	N/A	20.8	0	0	0	N/A	N
1/20/2021	8:12 PM	**Wood Side Drive**	35	SSW	8	N/A	N/A	N/A	20.8	0	0	0	N/A	N
1/20/2021	8:16 PM	**Edgefield RD**	35	SSW	8	N/A	N/A	N/A	20.8	0	0	0	N/A	N
1/25/2021	6:04 PM	Gate	48	WSW	0	0	20.7	79.3	N/A	N/A	N/A	N/A	N/A	N
1/25/2021	6:07 PM	Animal Shelter	48	WSW	0	0	20.5	79.5	N/A	N/A	N/A	N/A	N/A	N
1/25/2021	6:09 PM	Worley's(Shakesville Rd)	48	WSW	0	0	20.4	79.5	N/A	N/A	N/A	N/A	N/A	N
1/25/2021	6:11 PM	Jane Lane	48	WSW	0	0	20.3	79.6	N/A	N/A	N/A	N/A	N/A	N
1/25/2021	6:13 PM	Old Enterance	48	WSW	0	0	20.2	79.8	N/A	N/A	N/A	N/A	N/A	N
1/25/2021	6:23 PM	1st Speed Bump	48	WSW	0	0	19.7	80.2	N/A	N/A	N/A	N/A	N/A	N
1/25/2021	6:24 PM	2nd Speed Bump	48	WSW	0	0	19.7	80.2	N/A	N/A	N/A	N/A	N/A	N
1/25/2021	6:28 PM	3rd Speed Bump	48	WSW	0	0	19.7	80.3	N/A	N/A	N/A	N/A	N/A	N
1/25/2021	7:26 PM	Dollar General	48	WSW	0	0	20.4	79.6	N/A	N/A	N/A	N/A	0	N
1/27/2021	7:12 PM	Gate	45	N	16	0	20.4	79.8	N/A	N/A	N/A	N/A	N/A	N
1/27/2021	7:15 PM	Animal Shelter	45	N	16	0	20.4	79.3	N/A	N/A	N/A	N/A	N/A	N
1/27/2021	7:18 PM	Worley's(Shakesville Rd)	45	N	16	0	20.7	79.2	N/A	N/A	N/A	N/A	N/A	N
1/27/2021	7:21 PM	Northend of Booher RD	45	N	16	0	20.6	79.7	N/A	N/A	N/A	N/A	N/A	N
1/27/2021	7:24 PM	Tracey Lane	45	N	16	0	20.7	79.4	N/A	N/A	N/A	N/A	N/A	N
1/27/2021	7:28 PM	1st Speed Bump(Booher Rd)	45	N	16	0	20.8	79.2	N/A	N/A	N/A	N/A	N/A	N
1/27/2021	7:31 PM	2nd Speed Bump(Booher Rd)	45	N	16	0	20.4	79.9	N/A	N/A	N/A	N/A	N/A	N
1/27/2021	7:42 PM	3rd Speed Bump(Booher Rd)	45	N	16	0	20.6	79.6	N/A	N/A	N/A	N/A	N/A	N
1/27/2021	7:50 PM	Culdasack in Edgefield	45	N	16	0	20.8	79.2	N/A	N/A	N/A	N/A	N/A	N

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, LLC
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

January 13, 2021

Mr. Mark Campbell
Bristol Solid Waste Management Facility
2125 Shakesville Rd
Bristol, VA 24201

RE: Project: City of Bristol Landfill
Pace Project No.: 92515956

Dear Mr. Campbell:

Enclosed are the analytical results for sample(s) received by the laboratory on January 12, 2021. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace National - Mt. Juliet

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A. Payne

Amanda Payne
amanda.payne@pacelabs.com
(704)875-9092
Project Manager

Enclosures

cc: Ms. Carrie Blankenship, Draper Aden Associates
Ms. Janet Frazier, Draper Aden Associates
Kathy Olsen, Draper Aden Associates

Pace Analytical Services, LLC
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

CERTIFICATIONS

Project: City of Bristol Landfill
Pace Project No.: 92515956

Pace Analytical Services National
12065 Lebanon Road, Mt. Juliet, TN 37122
Alabama Certification #: 40660
Alaska Certification 17-026
Arizona Certification #: AZ0612
Arkansas Certification #: 88-0469
California Certification #: 2932
Canada Certification #: 1461.01
Colorado Certification #: TN00003
Connecticut Certification #: PH-0197
DOD Certification: #1461.01
EPA# TN00003
Florida Certification #: E87487
Georgia DW Certification #: 923
Georgia Certification: NELAP
Idaho Certification #: TN00003
Illinois Certification #: 200008
Indiana Certification #: C-TN-01
Iowa Certification #: 364
Kansas Certification #: E-10277
Kentucky UST Certification #: 16
Kentucky Certification #: 90010
Louisiana Certification #: AI30792
Louisiana DW Certification #: LA180010
Maine Certification #: TN0002
Maryland Certification #: 324
Massachusetts Certification #: M-TN003
Michigan Certification #: 9958
Minnesota Certification #: 047-999-395
Mississippi Certification #: TN00003
Missouri Certification #: 340
Montana Certification #: CERT0086
Nebraska Certification #: NE-OS-15-05
Nevada Certification #: TN-03-2002-34
New Hampshire Certification #: 2975
New Jersey Certification #: TN002
New Mexico DW Certification
New York Certification #: 11742
North Carolina Aquatic Toxicity Certification #: 41
North Carolina Drinking Water Certification #: 21704
North Carolina Environmental Certificate #: 375
North Dakota Certification #: R-140
Ohio VAP Certification #: CL0069
Oklahoma Certification #: 9915
Oregon Certification #: TN200002
Pennsylvania Certification #: 68-02979
Rhode Island Certification #: LAO00356
South Carolina Certification #: 84004
South Dakota Certification
Tennessee DW/Chem/Micro Certification #: 2006
Texas Certification #: T 104704245-17-14
Texas Mold Certification #: LAB0152
USDA Soil Permit #: P330-15-00234
Utah Certification #: TN00003
Virginia Certification #: VT2006
Vermont Dept. of Health: ID# VT-2006
Virginia Certification #: 460132
Washington Certification #: C847
West Virginia Certification #: 233
Wisconsin Certification #: 998093910
Wyoming UST Certification #: via A2LA 2926.01
A2LA-ISO 17025 Certification #: 1461.01
A2LA-ISO 17025 Certification #: 1461.02
AIHA-LAP/LLC EMLAP Certification #:100789

Pace Analytical Services, LLC
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

SAMPLE SUMMARY

Project: City of Bristol Landfill
Pace Project No.: 92515956

Lab ID	Sample ID	Matrix	Date Collected	Date Received
92515956001	Shakesville Rd	Air	01/10/21 20:58	01/12/21 11:00
92515956002	Maryland Ave/Poplar St	Air	01/10/21 21:15	01/12/21 11:00

Pace Analytical Services, LLC
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

SAMPLE ANALYTE COUNT

Project: City of Bristol Landfill
Pace Project No.: 92515956

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
92515956001	Shakesville Rd	TO-15	CAW	68	PAN
92515956002	Maryland Ave/Poplar St	TO-15	CAW	68	PAN

PAN = Pace National - Mt. Juliet

Pace Analytical
www.pacelabs.com

Pace Analytical Services, LLC
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

SUMMARY OF DETECTION

Project: City of Bristol Landfill
Pace Project No.: 92515956

Lab Sample ID / Method	Client Sample ID / Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
92515956001	**Shakesville Rd**					
TO-15	Acetone	6.75	ug/m3	2.97	01/12/21 16:55	
TO-15	Benzene	7.51	ug/m3	0.639	01/12/21 16:55	
TO-15	1,3-Butadiene	0.768J	ug/m3	4.43	01/12/21 16:55	J
TO-15	Carbon tetrachloride	0.525J	ug/m3	1.26	01/12/21 16:55	J
TO-15	Chloromethane	1.04	ug/m3	0.413	01/12/21 16:55	
TO-15	Ethanol	4.85	ug/m3	1.19	01/12/21 16:55	
TO-15	Ethylbenzene	1.76	ug/m3	0.867	01/12/21 16:55	
TO-15	4-Ethyltoluene	1.72	ug/m3	0.982	01/12/21 16:55	
TO-15	Trichlorofluoromethane	1.20	ug/m3	1.12	01/12/21 16:55	
TO-15	Dichlorodifluoromethane	2.37	ug/m3	0.989	01/12/21 16:55	
TO-15	n-Heptane	0.462J	ug/m3	0.818	01/12/21 16:55	J
TO-15	Methylene Chloride	0.590J	ug/m3	0.694	01/12/21 16:55	J
TO-15	2-Butanone (MEK)	0.973J	ug/m3	3.69	01/12/21 16:55	J
TO-15	Propylene	3.41	ug/m3	0.689	01/12/21 16:55	
TO-15	Styrene	0.651J	ug/m3	0.851	01/12/21 16:55	J
TO-15	Toluene	5.24	ug/m3	1.88	01/12/21 16:55	
TO-15	1,2,4-Trimethylbenzene	1.81	ug/m3	0.982	01/12/21 16:55	
TO-15	1,3,5-Trimethylbenzene	0.525J	ug/m3	0.982	01/12/21 16:55	J
TO-15	2,2,4-Trimethylpentane	0.813J	ug/m3	0.934	01/12/21 16:55	J
TO-15	m&p-Xylene	5.07	ug/m3	1.73	01/12/21 16:55	
TO-15	o-Xylene	1.85	ug/m3	0.867	01/12/21 16:55	
92515956002	**Maryland Ave/Poplar St**					
TO-15	Acetone	8.32	ug/m3	2.97	01/12/21 17:35	
TO-15	Benzene	23.3	ug/m3	0.639	01/12/21 17:35	
TO-15	Carbon tetrachloride	0.488J	ug/m3	1.26	01/12/21 17:35	J
TO-15	Chloromethane	2.09	ug/m3	0.413	01/12/21 17:35	
TO-15	Ethanol	11.8	ug/m3	1.19	01/12/21 17:35	
TO-15	Ethylbenzene	3.23	ug/m3	0.867	01/12/21 17:35	
TO-15	4-Ethyltoluene	1.34	ug/m3	0.982	01/12/21 17:35	
TO-15	Trichlorofluoromethane	1.39	ug/m3	1.12	01/12/21 17:35	
TO-15	Dichlorodifluoromethane	2.33	ug/m3	0.989	01/12/21 17:35	
TO-15	n-Heptane	1.15	ug/m3	0.818	01/12/21 17:35	
TO-15	n-Hexane	1.70J	ug/m3	2.22	01/12/21 17:35	J
TO-15	Methylene Chloride	0.802	ug/m3	0.694	01/12/21 17:35	
TO-15	2-Butanone (MEK)	2.75J	ug/m3	3.69	01/12/21 17:35	J
TO-15	Methyl methacrylate	0.369J	ug/m3	0.819	01/12/21 17:35	J
TO-15	2-Propanol	3.98	ug/m3	3.07	01/12/21 17:35	
TO-15	Propylene	6.92	ug/m3	0.689	01/12/21 17:35	
TO-15	Styrene	0.698J	ug/m3	0.851	01/12/21 17:35	J
TO-15	Toluene	6.22	ug/m3	1.88	01/12/21 17:35	
TO-15	1,2,4-Trimethylbenzene	1.33	ug/m3	0.982	01/12/21 17:35	
TO-15	1,3,5-Trimethylbenzene	0.496J	ug/m3	0.982	01/12/21 17:35	J
TO-15	2,2,4-Trimethylpentane	1.37	ug/m3	0.934	01/12/21 17:35	
TO-15	m&p-Xylene	4.38	ug/m3	1.73	01/12/21 17:35	
TO-15	o-Xylene	1.59	ug/m3	0.867	01/12/21 17:35	

REPORT OF LABORATORY ANALYSIS

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, LLC
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

PROJECT NARRATIVE

Project: City of Bristol Landfill
Pace Project No.: 92515956

Method: **TO-15**
Description: VOA (MS) TO-15
Client: Draper Aden - Virginia
Date: January 13, 2021

General Information:
2 samples were analyzed for TO-15 by Pace National Mt. Juliet. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Additional Comments:

This data package has been reviewed for quality and completeness and is approved for release.

Pace Analytical
www.pacelabs.com

Pace Analytical Services, LLC
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

ANALYTICAL RESULTS

Project: City of Bristol Landfill
Pace Project No.: 92515956

Sample: Shakesville Rd **Lab ID: 92515956001** Collected: 01/10/21 20:58 Received: 01/12/21 11:00 Matrix: Air

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
VOA (MS) TO-15	Analytical Method: TO-15 Preparation Method: TO-15 Pace National - Mt. Juliet								
Acetone	**6.75**	ug/m3	2.97	1.39	1	01/12/21 16:55	01/12/21 16:55	67-64-1	
Allyl chloride	ND	ug/m3	0.626	0.357	1	01/12/21 16:55	01/12/21 16:55	107-05-1	
Benzene	**7.51**	ug/m3	0.639	0.228	1	01/12/21 16:55	01/12/21 16:55	71-43-2	
Benzyl chloride	ND	ug/m3	1.04	0.311	1	01/12/21 16:55	01/12/21 16:55	100-44-7	
Bromodichloromethane	ND	ug/m3	1.34	0.471	1	01/12/21 16:55	01/12/21 16:55	75-27-4	
Bromoform	ND	ug/m3	6.21	0.757	1	01/12/21 16:55	01/12/21 16:55	75-25-2	
Bromomethane	ND	ug/m3	0.776	0.381	1	01/12/21 16:55	01/12/21 16:55	74-83-9	
1,3-Butadiene	**0.768J**	ug/m3	4.43	0.230	1	01/12/21 16:55	01/12/21 16:55	106-99-0	J
Carbon disulfide	ND	ug/m3	0.622	0.317	1	01/12/21 16:55	01/12/21 16:55	75-15-0	
Carbon tetrachloride	**0.525J**	ug/m3	1.26	0.461	1	01/12/21 16:55	01/12/21 16:55	56-23-5	J
Chlorobenzene	ND	ug/m3	0.924	0.385	1	01/12/21 16:55	01/12/21 16:55	108-90-7	
Chloroethane	ND	ug/m3	0.528	0.263	1	01/12/21 16:55	01/12/21 16:55	75-00-3	
Chloroform	ND	ug/m3	0.973	0.349	1	01/12/21 16:55	01/12/21 16:55	67-66-3	
Chloromethane	**1.04**	ug/m3	0.413	0.213	1	01/12/21 16:55	01/12/21 16:55	74-87-3	
2-Chlorotoluene	ND	ug/m3	1.03	0.427	1	01/12/21 16:55	01/12/21 16:55	95-49-8	
Cyclohexane	ND	ug/m3	0.689	0.259	1	01/12/21 16:55	01/12/21 16:55	110-82-7	
Dibromochloromethane	ND	ug/m3	1.70	0.618	1	01/12/21 16:55	01/12/21 16:55	124-48-1	
1,2-Dibromoethane (EDB)	ND	ug/m3	1.54	0.554	1	01/12/21 16:55	01/12/21 16:55	106-93-4	
1,2-Dichlorobenzene	ND	ug/m3	1.20	0.770	1	01/12/21 16:55	01/12/21 16:55	95-50-1	
1,3-Dichlorobenzene	ND	ug/m3	1.20	1.09	1	01/12/21 16:55	01/12/21 16:55	541-73-1	
1,4-Dichlorobenzene	ND	ug/m3	1.20	0.335	1	01/12/21 16:55	01/12/21 16:55	106-46-7	
1,2-Dichloroethane	ND	ug/m3	0.810	0.283	1	01/12/21 16:55	01/12/21 16:55	107-06-2	
1,1-Dichloroethane	ND	ug/m3	0.802	0.290	1	01/12/21 16:55	01/12/21 16:55	75-34-3	
1,1-Dichloroethene	ND	ug/m3	0.793	0.302	1	01/12/21 16:55	01/12/21 16:55	75-35-4	
cis-1,2-Dichloroethene	ND	ug/m3	0.793	0.311	1	01/12/21 16:55	01/12/21 16:55	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.793	0.267	1	01/12/21 16:55	01/12/21 16:55	156-60-5	
1,2-Dichloropropane	ND	ug/m3	0.924	0.351	1	01/12/21 16:55	01/12/21 16:55	78-87-5	
cis-1,3-Dichloropropene	ND	ug/m3	0.908	0.313	1	01/12/21 16:55	01/12/21 16:55	10061-01-5	
trans-1,3-Dichloropropene	ND	ug/m3	0.908	0.331	1	01/12/21 16:55	01/12/21 16:55	10061-02-6	
1,4-Dioxane (p-Dioxane)	ND	ug/m3	0.721	0.300	1	01/12/21 16:55	01/12/21 16:55	123-91-1	
Ethanol	**4.85**	ug/m3	1.19	0.500	1	01/12/21 16:55	01/12/21 16:55	64-17-5	
Ethylbenzene	**1.76**	ug/m3	0.867	0.362	1	01/12/21 16:55	01/12/21 16:55	100-41-4	
4-Ethyltoluene	**1.72**	ug/m3	0.982	0.384	1	01/12/21 16:55	01/12/21 16:55	622-96-8	
Trichlorofluoromethane	**1.20**	ug/m3	1.12	0.460	1	01/12/21 16:55	01/12/21 16:55	75-69-4	
Dichlorodifluoromethane	**2.37**	ug/m3	0.989	0.678	1	01/12/21 16:55	01/12/21 16:55	75-71-8	
1,1,2-Trichlorotrifluoroethane	ND	ug/m3	1.53	0.608	1	01/12/21 16:55	01/12/21 16:55	76-13-1	
Dichlorotetrafluoroethane	ND	ug/m3	1.40	0.622	1	01/12/21 16:55	01/12/21 16:55	76-14-2	
n-Heptane	**0.462J**	ug/m3	0.818	0.425	1	01/12/21 16:55	01/12/21 16:55	142-82-5	J
Hexachloro-1,3-butadiene	ND	ug/m3	6.73	1.12	1	01/12/21 16:55	01/12/21 16:55	87-68-3	
n-Hexane	ND	ug/m3	2.22	0.726	1	01/12/21 16:55	01/12/21 16:55	110-54-3	
Isopropylbenzene (Cumene)	ND	ug/m3	0.983	0.382	1	01/12/21 16:55	01/12/21 16:55	98-82-8	
Methylene Chloride	**0.590J**	ug/m3	0.694	0.340	1	01/12/21 16:55	01/12/21 16:55	75-09-2	J
2-Hexanone	ND	ug/m3	5.11	0.544	1	01/12/21 16:55	01/12/21 16:55	591-78-6	
2-Butanone (MEK)	**0.973J**	ug/m3	3.69	0.240	1	01/12/21 16:55	01/12/21 16:55	78-93-3	J
4-Methyl-2-pentanone (MIBK)	ND	ug/m3	5.12	0.313	1	01/12/21 16:55	01/12/21 16:55	108-10-1	

REPORT OF LABORATORY ANALYSIS

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, LLC
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

ANALYTICAL RESULTS

Project: City of Bristol Landfill
Pace Project No.: 92515956

Sample: Shakesville Rd **Lab ID: 92515956001** Collected: 01/10/21 20:58 Received: 01/12/21 11:00 Matrix: Air

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
VOA (MS) TO-15	Analytical Method: TO-15 Preparation Method: TO-15 Pace National - Mt. Juliet								
Methyl methacrylate	ND	ug/m3	0.819	0.359	1	01/12/21 16:55	01/12/21 16:55	80-62-6	
Methyl-tert-butyl ether	ND	ug/m3	0.721	0.233	1	01/12/21 16:55	01/12/21 16:55	1634-04-4	
Naphthalene	ND	ug/m3	3.30	1.83	1	01/12/21 16:55	01/12/21 16:55	91-20-3	
2-Propanol	ND	ug/m3	3.07	0.649	1	01/12/21 16:55	01/12/21 16:55	67-63-0	
Propylene	**3.41**	ug/m3	0.689	0.160	1	01/12/21 16:55	01/12/21 16:55	115-07-1	
Styrene	**0.651J**	ug/m3	0.851	0.335	1	01/12/21 16:55	01/12/21 16:55	100-42-5	J
1,1,2,2-Tetrachloroethane	ND	ug/m3	1.37	0.511	1	01/12/21 16:55	01/12/21 16:55	79-34-5	
Tetrachloroethene	ND	ug/m3	1.36	0.553	1	01/12/21 16:55	01/12/21 16:55	127-18-4	
Tetrahydrofuran	ND	ug/m3	0.590	0.216	1	01/12/21 16:55	01/12/21 16:55	109-99-9	
Toluene	**5.24**	ug/m3	1.88	0.328	1	01/12/21 16:55	01/12/21 16:55	108-88-3	
1,2,4-Trichlorobenzene	ND	ug/m3	4.66	1.10	1	01/12/21 16:55	01/12/21 16:55	120-82-1	
1,1,1-Trichloroethane	ND	ug/m3	1.09	0.400	1	01/12/21 16:55	01/12/21 16:55	71-55-6	
1,1,2-Trichloroethane	ND	ug/m3	1.09	0.422	1	01/12/21 16:55	01/12/21 16:55	79-00-5	
Trichloroethene	ND	ug/m3	1.07	0.364	1	01/12/21 16:55	01/12/21 16:55	79-01-6	
1,2,4-Trimethylbenzene	**1.81**	ug/m3	0.982	0.375	1	01/12/21 16:55	01/12/21 16:55	95-63-6	
1,3,5-Trimethylbenzene	**0.525J**	ug/m3	0.982	0.382	1	01/12/21 16:55	01/12/21 16:55	108-67-8	J
2,2,4-Trimethylpentane	**0.813J**	ug/m3	0.934	0.621	1	01/12/21 16:55	01/12/21 16:55	540-84-1	J
Vinyl chloride	ND	ug/m3	0.511	0.243	1	01/12/21 16:55	01/12/21 16:55	75-01-4	
Vinyl bromide	ND	ug/m3	0.875	0.373	1	01/12/21 16:55	01/12/21 16:55	593-60-2	
Vinyl acetate	ND	ug/m3	0.704	0.408	1	01/12/21 16:55	01/12/21 16:55	108-05-4	
m&p-Xylene	**5.07**	ug/m3	1.73	0.585	1	01/12/21 16:55	01/12/21 16:55	179601-23-1	
o-Xylene	**1.85**	ug/m3	0.867	0.359	1	01/12/21 16:55	01/12/21 16:55	95-47-6	
Surrogates									
1,4-Dichlorobenzene-d4 (IS)	95.1	%	60.0-140		1	01/12/21 16:55	01/12/21 16:55	3855-82-1	

REPORT OF LABORATORY ANALYSIS

Pace Analytical
www.pacelabs.com

Pace Analytical Services, LLC
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

ANALYTICAL RESULTS

Project: City of Bristol Landfill
Pace Project No.: 92515956

Sample: Maryland Ave/Poplar St **Lab ID: 92515956002** Collected: 01/10/21 21:15 Received: 01/12/21 11:00 Matrix: Air

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
VOA (MS) TO-15	Analytical Method: TO-15 Preparation Method: TO-15 Pace National - Mt. Juliet								
Acetone	**8.32**	ug/m3	2.97	1.39	1	01/12/21 17:35	01/12/21 17:35	67-64-1	
Allyl chloride	ND	ug/m3	0.626	0.357	1	01/12/21 17:35	01/12/21 17:35	107-05-1	
Benzene	**23.3**	ug/m3	0.639	0.228	1	01/12/21 17:35	01/12/21 17:35	71-43-2	
Benzyl chloride	ND	ug/m3	1.04	0.311	1	01/12/21 17:35	01/12/21 17:35	100-44-7	
Bromodichloromethane	ND	ug/m3	1.34	0.471	1	01/12/21 17:35	01/12/21 17:35	75-27-4	
Bromoform	ND	ug/m3	6.21	0.757	1	01/12/21 17:35	01/12/21 17:35	75-25-2	
Bromomethane	ND	ug/m3	0.776	0.381	1	01/12/21 17:35	01/12/21 17:35	74-83-9	
1,3-Butadiene	ND	ug/m3	4.43	0.230	1	01/12/21 17:35	01/12/21 17:35	106-99-0	
Carbon disulfide	ND	ug/m3	0.622	0.317	1	01/12/21 17:35	01/12/21 17:35	75-15-0	
Carbon tetrachloride	**0.488J**	ug/m3	1.26	0.461	1	01/12/21 17:35	01/12/21 17:35	56-23-5	J
Chlorobenzene	ND	ug/m3	0.924	0.385	1	01/12/21 17:35	01/12/21 17:35	108-90-7	
Chloroethane	ND	ug/m3	0.528	0.263	1	01/12/21 17:35	01/12/21 17:35	75-00-3	
Chloroform	ND	ug/m3	0.973	0.349	1	01/12/21 17:35	01/12/21 17:35	67-66-3	
Chloromethane	**2.09**	ug/m3	0.413	0.213	1	01/12/21 17:35	01/12/21 17:35	74-87-3	
2-Chlorotoluene	ND	ug/m3	1.03	0.427	1	01/12/21 17:35	01/12/21 17:35	95-49-8	
Cyclohexane	ND	ug/m3	0.689	0.259	1	01/12/21 17:35	01/12/21 17:35	110-82-7	
Dibromochloromethane	ND	ug/m3	1.70	0.618	1	01/12/21 17:35	01/12/21 17:35	124-48-1	
1,2-Dibromoethane (EDB)	ND	ug/m3	1.54	0.554	1	01/12/21 17:35	01/12/21 17:35	106-93-4	
1,2-Dichlorobenzene	ND	ug/m3	1.20	0.770	1	01/12/21 17:35	01/12/21 17:35	95-50-1	
1,3-Dichlorobenzene	ND	ug/m3	1.20	1.09	1	01/12/21 17:35	01/12/21 17:35	541-73-1	
1,4-Dichlorobenzene	ND	ug/m3	1.20	0.335	1	01/12/21 17:35	01/12/21 17:35	106-46-7	
1,2-Dichloroethane	ND	ug/m3	0.810	0.283	1	01/12/21 17:35	01/12/21 17:35	107-06-2	
1,1-Dichloroethane	ND	ug/m3	0.802	0.290	1	01/12/21 17:35	01/12/21 17:35	75-34-3	
1,1-Dichloroethene	ND	ug/m3	0.793	0.302	1	01/12/21 17:35	01/12/21 17:35	75-35-4	
cis-1,2-Dichloroethene	ND	ug/m3	0.793	0.311	1	01/12/21 17:35	01/12/21 17:35	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.793	0.267	1	01/12/21 17:35	01/12/21 17:35	156-60-5	
1,2-Dichloropropane	ND	ug/m3	0.924	0.351	1	01/12/21 17:35	01/12/21 17:35	78-87-5	
cis-1,3-Dichloropropene	ND	ug/m3	0.908	0.313	1	01/12/21 17:35	01/12/21 17:35	10061-01-5	
trans-1,3-Dichloropropene	ND	ug/m3	0.908	0.331	1	01/12/21 17:35	01/12/21 17:35	10061-02-6	
1,4-Dioxane (p-Dioxane)	ND	ug/m3	0.721	0.300	1	01/12/21 17:35	01/12/21 17:35	123-91-1	
Ethanol	**11.8**	ug/m3	1.19	0.500	1	01/12/21 17:35	01/12/21 17:35	64-17-5	
Ethylbenzene	**3.23**	ug/m3	0.867	0.362	1	01/12/21 17:35	01/12/21 17:35	100-41-4	
4-Ethyltoluene	**1.34**	ug/m3	0.982	0.384	1	01/12/21 17:35	01/12/21 17:35	622-96-8	
Trichlorofluoromethane	**1.39**	ug/m3	1.12	0.460	1	01/12/21 17:35	01/12/21 17:35	75-69-4	
Dichlorodifluoromethane	**2.33**	ug/m3	0.989	0.678	1	01/12/21 17:35	01/12/21 17:35	75-71-8	
1,1,2-Trichlorotrifluoroethane	ND	ug/m3	1.53	0.608	1	01/12/21 17:35	01/12/21 17:35	76-13-1	
Dichlorotetrafluoroethane	ND	ug/m3	1.40	0.622	1	01/12/21 17:35	01/12/21 17:35	76-14-2	
n-Heptane	**1.15**	ug/m3	0.818	0.425	1	01/12/21 17:35	01/12/21 17:35	142-82-5	
Hexachloro-1,3-butadiene	ND	ug/m3	6.73	1.12	1	01/12/21 17:35	01/12/21 17:35	87-68-3	
n-Hexane	**1.70J**	ug/m3	2.22	0.726	1	01/12/21 17:35	01/12/21 17:35	110-54-3	J
Isopropylbenzene (Cumene)	ND	ug/m3	0.983	0.382	1	01/12/21 17:35	01/12/21 17:35	98-82-8	
Methylene Chloride	**0.802**	ug/m3	0.694	0.340	1	01/12/21 17:35	01/12/21 17:35	75-09-2	
2-Hexanone	ND	ug/m3	5.11	0.544	1	01/12/21 17:35	01/12/21 17:35	591-78-6	
2-Butanone (MEK)	**2.75J**	ug/m3	3.69	0.240	1	01/12/21 17:35	01/12/21 17:35	78-93-3	J
4-Methyl-2-pentanone (MIBK)	ND	ug/m3	5.12	0.313	1	01/12/21 17:35	01/12/21 17:35	108-10-1	

REPORT OF LABORATORY ANALYSIS

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, LLC
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

ANALYTICAL RESULTS

Project: City of Bristol Landfill
Pace Project No.: 92515956

Sample: Maryland Ave/Poplar St **Lab ID: 92515956002** Collected: 01/10/21 21:15 Received: 01/12/21 11:00 Matrix: Air

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
VOA (MS) TO-15	Analytical Method: TO-15 Preparation Method: TO-15 Pace National - Mt. Juliet								
Methyl methacrylate	**0.369J**	ug/m3	0.819	0.359	1	01/12/21 17:35	01/12/21 17:35	80-62-6	J
Methyl-tert-butyl ether	ND	ug/m3	0.721	0.233	1	01/12/21 17:35	01/12/21 17:35	1634-04-4	
Naphthalene	ND	ug/m3	3.30	1.83	1	01/12/21 17:35	01/12/21 17:35	91-20-3	
2-Propanol	**3.98**	ug/m3	3.07	0.649	1	01/12/21 17:35	01/12/21 17:35	67-63-0	
Propylene	**6.92**	ug/m3	0.689	0.160	1	01/12/21 17:35	01/12/21 17:35	115-07-1	
Styrene	**0.698J**	ug/m3	0.851	0.335	1	01/12/21 17:35	01/12/21 17:35	100-42-5	J
1,1,2,2-Tetrachloroethane	ND	ug/m3	1.37	0.511	1	01/12/21 17:35	01/12/21 17:35	79-34-5	
Tetrachloroethene	ND	ug/m3	1.36	0.553	1	01/12/21 17:35	01/12/21 17:35	127-18-4	
Tetrahydrofuran	ND	ug/m3	0.590	0.216	1	01/12/21 17:35	01/12/21 17:35	109-99-9	
Toluene	**6.22**	ug/m3	1.88	0.328	1	01/12/21 17:35	01/12/21 17:35	108-88-3	
1,2,4-Trichlorobenzene	ND	ug/m3	4.66	1.10	1	01/12/21 17:35	01/12/21 17:35	120-82-1	
1,1,1-Trichloroethane	ND	ug/m3	1.09	0.400	1	01/12/21 17:35	01/12/21 17:35	71-55-6	
1,1,2-Trichloroethane	ND	ug/m3	1.09	0.422	1	01/12/21 17:35	01/12/21 17:35	79-00-5	
Trichloroethene	ND	ug/m3	1.07	0.364	1	01/12/21 17:35	01/12/21 17:35	79-01-6	
1,2,4-Trimethylbenzene	**1.33**	ug/m3	0.982	0.375	1	01/12/21 17:35	01/12/21 17:35	95-63-6	
1,3,5-Trimethylbenzene	**0.496J**	ug/m3	0.982	0.382	1	01/12/21 17:35	01/12/21 17:35	108-67-8	J
2,2,4-Trimethylpentane	**1.37**	ug/m3	0.934	0.621	1	01/12/21 17:35	01/12/21 17:35	540-84-1	
Vinyl chloride	ND	ug/m3	0.511	0.243	1	01/12/21 17:35	01/12/21 17:35	75-01-4	
Vinyl bromide	ND	ug/m3	0.875	0.373	1	01/12/21 17:35	01/12/21 17:35	593-60-2	
Vinyl acetate	ND	ug/m3	0.704	0.408	1	01/12/21 17:35	01/12/21 17:35	108-05-4	
m&p-Xylene	**4.38**	ug/m3	1.73	0.585	1	01/12/21 17:35	01/12/21 17:35	179601-23-1	
o-Xylene	**1.59**	ug/m3	0.867	0.359	1	01/12/21 17:35	01/12/21 17:35	95-47-6	
Surrogates									
1,4-Dichlorobenzene-d4 (IS)	95.3	%	60.0-140		1	01/12/21 17:35	01/12/21 17:35	3855-82-1	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALITY CONTROL DATA

Project: City of Bristol Landfill
Pace Project No.: 92515956

QC Batch: 1604266
QC Batch Method: TO-15
Analysis Method: TO-15
Analysis Description: VOA (MS) TO-15
Laboratory: Pace National - Mt. Juliet
Associated Lab Samples: 92515956001, 92515956002

METHOD BLANK: R3611748-3 Matrix: Air
Associated Lab Samples: 92515956001, 92515956002

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Acetone	ug/m3	ND	2.97	1.39	01/12/21 10:18	
Allyl chloride	ug/m3	ND	0.626	0.357	01/12/21 10:18	
Benzene	ug/m3	ND	0.639	0.228	01/12/21 10:18	
Benzyl chloride	ug/m3	ND	1.04	0.311	01/12/21 10:18	
Bromodichloromethane	ug/m3	ND	1.34	0.471	01/12/21 10:18	
Bromoform	ug/m3	ND	6.21	0.757	01/12/21 10:18	
Bromomethane	ug/m3	ND	0.776	0.381	01/12/21 10:18	
1,3-Butadiene	ug/m3	ND	4.43	0.230	01/12/21 10:18	
Carbon disulfide	ug/m3	ND	0.622	0.317	01/12/21 10:18	
Carbon tetrachloride	ug/m3	ND	1.26	0.461	01/12/21 10:18	
Chlorobenzene	ug/m3	ND	0.924	0.385	01/12/21 10:18	
Chloroethane	ug/m3	ND	0.528	0.263	01/12/21 10:18	
Chloroform	ug/m3	ND	0.973	0.349	01/12/21 10:18	
Chloromethane	ug/m3	ND	0.413	0.213	01/12/21 10:18	
2-Chlorotoluene	ug/m3	ND	1.03	0.427	01/12/21 10:18	
Cyclohexane	ug/m3	ND	0.689	0.259	01/12/21 10:18	
Dibromochloromethane	ug/m3	ND	1.70	0.618	01/12/21 10:18	
1,2-Dibromoethane (EDB)	ug/m3	ND	1.54	0.554	01/12/21 10:18	
1,2-Dichlorobenzene	ug/m3	ND	1.20	0.770	01/12/21 10:18	
1,3-Dichlorobenzene	ug/m3	ND	1.20	1.09	01/12/21 10:18	
1,4-Dichlorobenzene	ug/m3	ND	1.20	0.335	01/12/21 10:18	
1,2-Dichloroethane	ug/m3	ND	0.810	0.283	01/12/21 10:18	
1,1-Dichloroethane	ug/m3	ND	0.802	0.290	01/12/21 10:18	
1,1-Dichloroethene	ug/m3	ND	0.793	0.302	01/12/21 10:18	
cis-1,2-Dichloroethene	ug/m3	ND	0.793	0.311	01/12/21 10:18	
trans-1,2-Dichloroethene	ug/m3	ND	0.793	0.267	01/12/21 10:18	
1,2-Dichloropropane	ug/m3	ND	0.924	0.351	01/12/21 10:18	
cis-1,3-Dichloropropene	ug/m3	ND	0.908	0.313	01/12/21 10:18	
trans-1,3-Dichloropropene	ug/m3	ND	0.908	0.331	01/12/21 10:18	
1,4-Dioxane (p-Dioxane)	ug/m3	ND	0.721	0.300	01/12/21 10:18	
Ethylbenzene	ug/m3	ND	0.867	0.362	01/12/21 10:18	
4-Ethyltoluene	ug/m3	ND	0.982	0.384	01/12/21 10:18	
Trichlorofluoromethane	ug/m3	ND	1.12	0.460	01/12/21 10:18	
Dichlorodifluoromethane	ug/m3	ND	0.989	0.678	01/12/21 10:18	
1,1,2-Trichlorotrifluoroethane	ug/m3	ND	1.53	0.608	01/12/21 10:18	
Dichlorotetrafluoroethane	ug/m3	ND	1.40	0.622	01/12/21 10:18	
n-Heptane	ug/m3	ND	0.818	0.425	01/12/21 10:18	
Hexachloro-1,3-butadiene	ug/m3	ND	6.73	1.12	01/12/21 10:18	
n-Hexane	ug/m3	ND	2.22	0.726	01/12/21 10:18	
Isopropylbenzene (Cumene)	ug/m3	ND	0.983	0.382	01/12/21 10:18	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, LLC
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALITY CONTROL DATA

Project: City of Bristol Landfill
Pace Project No.: 92515956

METHOD BLANK: R3611748-3 Matrix: Air
Associated Lab Samples: 92515956001, 92515956002

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Methylene Chloride	ug/m3	ND	0.694	0.340	01/12/21 10:18	
2-Hexanone	ug/m3	ND	5.11	0.544	01/12/21 10:18	
2-Butanone (MEK)	ug/m3	ND	3.69	0.240	01/12/21 10:18	
4-Methyl-2-pentanone (MIBK)	ug/m3	ND	5.12	0.313	01/12/21 10:18	
Methyl methacrylate	ug/m3	ND	0.819	0.359	01/12/21 10:18	
Methyl-tert-butyl ether	ug/m3	ND	0.721	0.233	01/12/21 10:18	
Naphthalene	ug/m3	ND	3.30	1.83	01/12/21 10:18	
2-Propanol	ug/m3	ND	3.07	0.649	01/12/21 10:18	
Propylene	ug/m3	ND	0.689	0.160	01/12/21 10:18	
Styrene	ug/m3	ND	0.851	0.335	01/12/21 10:18	
1,1,2,2-Tetrachloroethane	ug/m3	ND	1.37	0.511	01/12/21 10:18	
Tetrachloroethene	ug/m3	ND	1.36	0.553	01/12/21 10:18	
Tetrahydrofuran	ug/m3	ND	0.590	0.216	01/12/21 10:18	
Toluene	ug/m3	ND	1.88	0.328	01/12/21 10:18	
1,2,4-Trichlorobenzene	ug/m3	ND	4.66	1.10	01/12/21 10:18	
1,1,1-Trichloroethane	ug/m3	ND	1.09	0.400	01/12/21 10:18	
1,1,2-Trichloroethane	ug/m3	ND	1.09	0.422	01/12/21 10:18	
Trichloroethene	ug/m3	ND	1.07	0.364	01/12/21 10:18	
1,2,4-Trimethylbenzene	ug/m3	ND	0.982	0.375	01/12/21 10:18	
1,3,5-Trimethylbenzene	ug/m3	ND	0.982	0.382	01/12/21 10:18	
2,2,4-Trimethylpentane	ug/m3	ND	0.934	0.621	01/12/21 10:18	
Vinyl chloride	ug/m3	ND	0.511	0.243	01/12/21 10:18	
Vinyl bromide	ug/m3	ND	0.875	0.373	01/12/21 10:18	
Vinyl acetate	ug/m3	ND	0.704	0.408	01/12/21 10:18	
m&p-Xylene	ug/m3	ND	1.73	0.585	01/12/21 10:18	
o-Xylene	ug/m3	ND	0.867	0.359	01/12/21 10:18	
Ethanol	ug/m3	ND	1.19	0.500	01/12/21 10:18	
1,4-Dichlorobenzene-d4 (IS)	%	94.2	60.0-140		01/12/21 10:18	

LABORATORY CONTROL SAMPLE & LCSD: R3611748-1 R3611748-2

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
Ethanol	ug/m3	3.75	6.39	6.20	90.4	87.7	55.0-148	2.99	25	
Propylene	ug/m3	3.75	6.47	6.39	100	98.9	64.0-144	1.34	25	
Dichlorodifluoromethane	ug/m3	3.75	18.7	18.5	101	100	64.0-139	1.06	25	
Dichlorotetrafluoroethane	ug/m3	3.75	26.9	26.4	103	101	70.0-130	2.10	25	
Chloromethane	ug/m3	3.75	7.83	7.75	101	100	70.0-130	1.06	25	
Vinyl chloride	ug/m3	3.75	10.0	9.36	105	97.6	70.0-130	6.86	25	
1,3-Butadiene	ug/m3	3.75	8.25	7.88	99.5	94.9	70.0-130	4.66	25	
Bromomethane	ug/m3	3.75	14.2	13.7	97.6	94.1	70.0-130	3.62	25	
Chloroethane	ug/m3	3.75	9.55	9.21	96.5	93.1	70.0-130	3.66	25	
Trichlorofluoromethane	ug/m3	3.75	20.5	20.2	97.3	95.7	70.0-130	1.66	25	
1,1,2-Trichlorotrifluoroethane	ug/m3	3.75	29.7	28.7	103	99.7	70.0-130	3.42	25	
1,1-Dichloroethene	ug/m3	3.75	15.2	14.6	102	98.4	70.0-130	3.98	25	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical
www.pacelabs.com

Pace Analytical Services, LLC
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALITY CONTROL DATA

Project: City of Bristol Landfill
Pace Project No.: 92515956

LABORATORY CONTROL SAMPLE & LCSD: R3611748-1 R3611748-2

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
1,1-Dichloroethane	ug/m3	3.75	15.0	15.0	99.5	99.5	70.0-130	0.00	25	
Acetone	ug/m3	3.75	8.51	8.20	95.5	92.0	70.0-130	3.70	25	
2-Propanol	ug/m3	3.75	9.34	8.90	101	96.5	70.0-139	4.85	25	
Carbon disulfide	ug/m3	3.75	11.9	11.6	102	99.2	70.0-130	2.65	25	
Methylene Chloride	ug/m3	3.75	12.4	12.0	95.2	92.3	70.0-130	3.13	25	
Methyl-tert-butyl ether	ug/m3	3.75	13.8	13.4	102	99.2	70.0-130	2.91	25	
trans-1,2-Dichloroethene	ug/m3	3.75	15.0	14.7	101	99.2	70.0-130	1.86	25	
n-Hexane	ug/m3	3.75	13.5	13.5	102	102	70.0-130	0.522	25	
Vinyl acetate	ug/m3	3.75	13.1	12.6	99.5	95.7	70.0-130	3.83	25	
2-Butanone (MEK)	ug/m3	3.75	11.1	11.1	101	101	70.0-130	0.00	25	
cis-1,2-Dichloroethene	ug/m3	3.75	15.1	14.9	102	101	70.0-130	1.06	25	
Chloroform	ug/m3	3.75	18.3	17.9	100	98.1	70.0-130	1.88	25	
Cyclohexane	ug/m3	3.75	13.6	13.3	105	103	70.0-130	2.05	25	
1,1,1-Trichloroethane	ug/m3	3.75	20.4	20.0	100	98.1	70.0-130	1.88	25	
Carbon tetrachloride	ug/m3	3.75	23.6	23.4	99.7	98.9	70.0-130	0.805	25	
Benzene	ug/m3	3.75	12.2	12.0	102	100	70.0-130	1.58	25	
1,2-Dichloroethane	ug/m3	3.75	15.3	15.0	101	98.9	70.0-130	1.60	25	
n-Heptane	ug/m3	3.75	16.1	15.8	105	103	70.0-130	1.54	25	
Trichloroethene	ug/m3	3.75	20.2	20.0	101	99.7	70.0-130	0.799	25	
1,2-Dichloropropane	ug/m3	3.75	17.6	17.2	102	99.5	70.0-130	2.12	25	
1,4-Dioxane (p-Dioxane)	ug/m3	3.75	14.1	13.7	104	102	70.0-140	2.59	25	
Bromodichloromethane	ug/m3	3.75	25.0	25.0	99.2	99.2	70.0-130	0.00	25	
cis-1,3-Dichloropropene	ug/m3	3.75	17.4	17.2	102	101	70.0-130	1.05	25	
4-Methyl-2-pentanone (MIBK)	ug/m3	3.75	15.9	15.6	103	101	70.0-139	2.08	25	
Toluene	ug/m3	3.75	14.4	14.2	102	101	70.0-130	1.06	25	
trans-1,3-Dichloropropene	ug/m3	3.75	17.4	17.2	102	101	70.0-130	1.05	25	
1,1,2-Trichloroethane	ug/m3	3.75	20.1	20.1	98.7	98.7	70.0-130	0.00	25	
Tetrachloroethene	ug/m3	3.75	25.3	25.2	99.5	98.9	70.0-130	0.538	25	
2-Hexanone	ug/m3	3.75	16.6	16.4	109	107	70.0-149	1.49	25	
Dibromochloromethane	ug/m3	3.75	32.3	31.8	101	99.7	70.0-130	1.59	25	
1,2-Dibromoethane (EDB)	ug/m3	3.75	29.2	29.4	101	102	70.0-130	0.525	25	
Chlorobenzene	ug/m3	3.75	17.4	17.2	101	99.5	70.0-130	1.07	25	
Ethylbenzene	ug/m3	3.75	16.7	16.4	103	101	70.0-130	2.09	25	
m&p-Xylene	ug/m3	7.50	34.1	33.7	105	104	70.0-130	1.15	25	
o-Xylene	ug/m3	3.75	17.0	16.7	105	103	70.0-130	2.06	25	
Styrene	ug/m3	3.75	16.8	16.7	106	105	70.0-130	1.02	25	
Bromoform	ug/m3	3.75	39.5	39.0	102	101	70.0-130	1.32	25	
1,1,2,2-Tetrachloroethane	ug/m3	3.75	26.0	25.5	101	98.9	70.0-130	2.13	25	
4-Ethyltoluene	ug/m3	3.75	19.5	19.0	106	103	70.0-130	2.54	25	
1,3,5-Trimethylbenzene	ug/m3	3.75	19.7	19.1	107	104	70.0-130	3.04	25	
1,2,4-Trimethylbenzene	ug/m3	3.75	19.8	19.2	107	104	70.0-130	3.02	25	
1,3-Dichlorobenzene	ug/m3	3.75	23.6	23.2	105	103	70.0-130	1.54	25	
1,4-Dichlorobenzene	ug/m3	3.75	24.2	23.8	107	106	70.0-130	1.75	25	
Benzyl chloride	ug/m3	3.75	24.9	24.7	128	127	70.0-152	0.839	25	
1,2-Dichlorobenzene	ug/m3	3.75	23.7	23.3	105	103	70.0-130	1.53	25	
1,2,4-Trichlorobenzene	ug/m3	3.75	29.7	29.5	107	106	70.0-160	0.500	25	
Hexachloro-1,3-butadiene	ug/m3	3.75	43.2	42.3	108	106	70.0-151	2.25	25	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALITY CONTROL DATA

Project: City of Bristol Landfill
Pace Project No.: 92515956

LABORATORY CONTROL SAMPLE & LCSD: R3611748-1 R3611748-2

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
Naphthalene	ug/m3	3.75	21.4	21.0	109	107	70.0-159	1.48	25	
Allyl chloride	ug/m3	3.75	11.9	11.0	101	93.9	70.0-130	7.65	25	
2-Chlorotoluene	ug/m3	3.75	20.2	19.8	105	103	70.0-130	1.80	25	
Methyl methacrylate	ug/m3	3.75	16.0	15.8	104	103	70.0-130	1.03	25	
Tetrahydrofuran	ug/m3	3.75	11.4	11.3	103	102	70.0-137	1.04	25	
2,2,4-Trimethylpentane	ug/m3	3.75	18.3	17.9	105	102	70.0-130	2.06	25	
Vinyl bromide	ug/m3	3.75	15.9	15.4	96.8	94.1	70.0-130	2.79	25	
Isopropylbenzene (Cumene)	ug/m3	3.75	19.3	18.9	105	103	70.0-130	1.80	25	
1,4-Dichlorobenzene-d4 (IS)	%				97.1	96.7	60.0-140			

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, LLC
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALIFIERS

Project: City of Bristol Landfill
Pace Project No.: 92515956

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

Acid preservation may not be appropriate for 2 Chloroethylvinyl ether.

A separate vial preserved to a pH of 4-5 is recommended in SW846 Chapter 4 for the analysis of Acrolein and Acrylonitrile by EPA Method 8260.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

J Analyte detected below the reporting limit, therefore result is an estimate. This qualifier is also used for all TICs.

Pace Analytical Services, LLC
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: City of Bristol Landfill
Pace Project No.: 92515956

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
92515956001	Shakesville Rd	TO-15	1604266	TO-15	1604266
92515956002	Maryland Ave/Poplar St	TO-15	1604266	TO-15	1604266

Pace Analytical - Huntersville, NC

9800 Kincey Avenue, Suite 100
Huntersville, NC 28078

Accounts Payable
9800 Kincey Ave., Ste. 100
Huntersville, NC 28078

Pres Chk

WO# : 92515956

92515956

Pace Analytical®
National Center for Testing & Innovation

12065 Lebanon Rd
Mount Juliet, TN 37122
Phone: 615-758-5858
Phone: 800-767-5859
Fax: 615-758-5859

D086

Report to: Amanda Payne

Email To: amanda.payne@pacelabs.com

Project Description: City of Bristol Landfill

City/State Collected: VA \ TN

Please Circle: PT MT CT ET

Phone: 704-875-9092

Client Project #

Lab Project # PACE-PAYNEVA

Collected by (print): David Cochran II

Site/Facility ID # City of Bristol VA

P.O. #

Collected by (signature):

Immediately Packed on Ice N X Y ___

Rush? (Lab MUST Be Notified)
___ Same Day ___ Five Day
X Next Day ___ 5 Day (Rad Only)
___ Two Day ___ 10 Day (Rad Only)
___ Three Day

Quote #

Date Results Needed

Table # 1305179

Acctnum: PACE

Template: T180063

Prelogin: P820498

PM: 844 - Christi M Wagner

PB: 1/21/21 1/6

Shipped Via: FedEX Ground

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	# of Cntrs	TO-15 Summa	METHOD 3C								Remarks	Sample # (lab only)
Shakesville Rd	GRAB	Air		1/10/21	8:58am	1	X	X									-01
Maryland Ave/Poplar St	GRAB	Air		1/10/21	9:15am	1	X	X									-02
		Air				1	X										
		Air				1	X										

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other_____

Remarks:

pH _____ Temp _____

Flow _____ Other _____

Samples returned via: ___ UPS ___ FedEx ✓ Courier _____

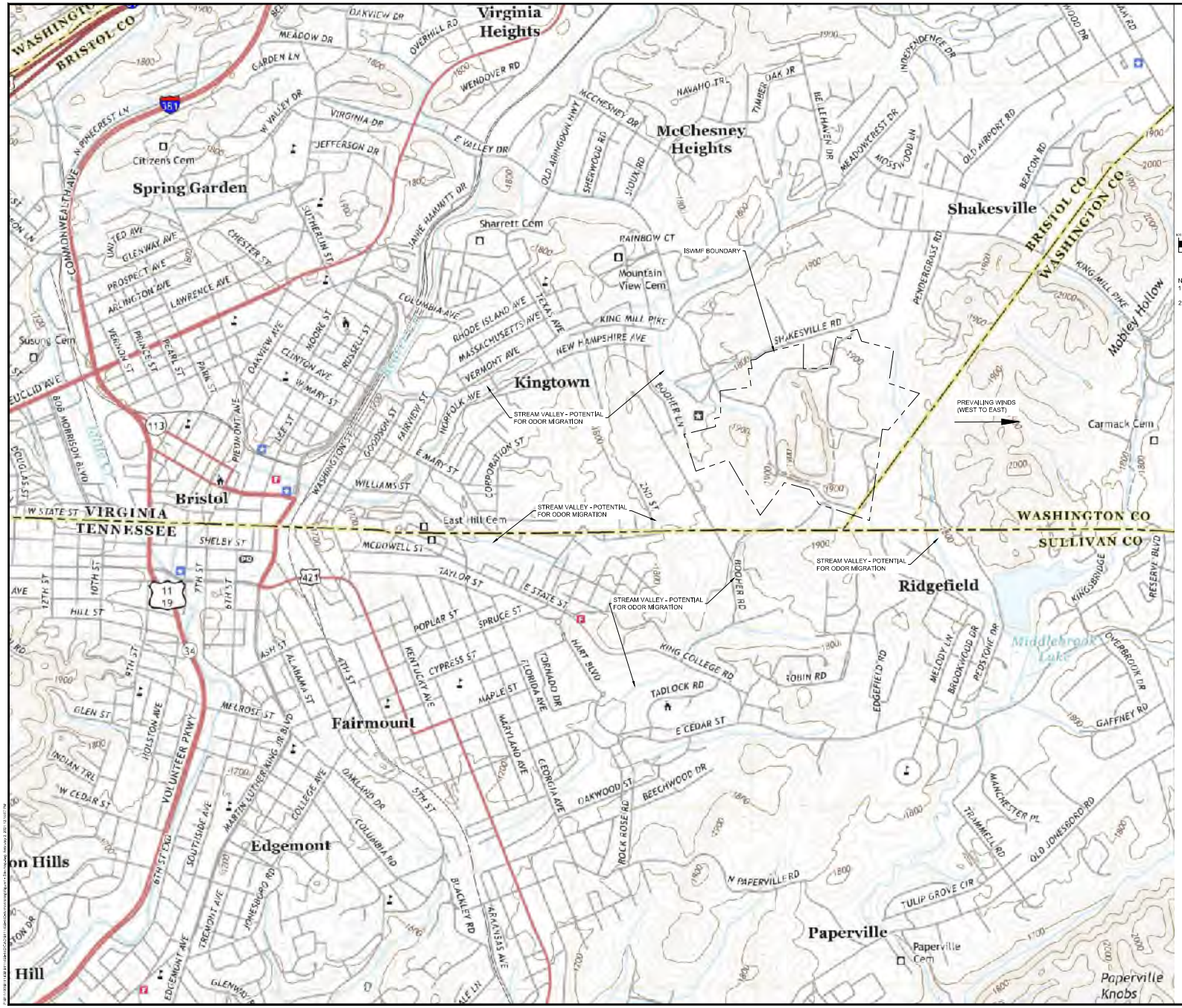
Tracking #

Sample Receipt Checklist

COC Seal Present/Intact:	___Y	___N
COC Signed/Accurate:	___Y	___N
Bottles arrive intact:	___Y	___N
Correct bottles used:	___Y	___N
Sufficient volume sent:	___Y	___N
If Applicable		
VOA Zero Headspace:	___Y	___N
Preservation Correct/Checked:	___Y	___N
RAD Screen <0.5 mR/hr:	___Y	___N

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Trip Blank Received: Yes / No HCL / MeoH TBR	Sample Receipt Checklist
	1/11/21	8:50am			
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Temp: 4°C Bottles Received: 2	If preservation required by Login: Date/Time
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: 1/12 Time: 1100	Hold: / Condition: NCF / OK

APPENDIX 2
Figures



GRAPHIC SCALE

(IN FEET)
1 inch = 800 ft.

NOTES:
1. BASE MAP IS THE USGS BRISTOL QUADRANGLE, 7.5-MINUTE SERIES DATED 2019.
2. PREVAILING WIND BASED ON WIND ROSE DATA FROM NEARBY AREAS.

Draper Aden Associates
Engineering • Surveying • Environmental Services
2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291
www.dadx.com
• Richmond, VA
• Raleigh, NC
• Fayetteville, NC
• Charlottesville, VA
• Northern Virginia
• Hampton Roads, VA

SITE MAP

AIR MONITORING PLAN

CITY OF BRISTOL (VA) ISWMF

REVISIONS

DESIGNED BY:	AST
DRAWN BY:	AST
CHECKED BY:	-
SCALE:	1" = 800'
DATE:	FEB 2021
PROJECT NUMBER:	B11145B-14D

FIG. 1

P:\B11\100\B11145B\B11145B-14D\CAD\B11145B-14D-Airmonitoring\Figure2 - Sample Location map.dwg March 31, 2021 3:32:19 PM

Draper Aden Associates
Engineering • Surveying • Environmental Services
2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291
Richmond, VA
Charlottesville, VA
Hampton Roads, VA
Raleigh, NC
Fayetteville, NC
Northern Virginia
Virginia Beach, VA

DESIGNED: AST
DRAWN: AST
CHECKED:
DATE: 03/31/2021

ODOR COMPLAINT RESPONSE PLAN

BRISTOL, VIRGINIA

SCALE: 1" = 250'

PROJECT: B11145B-14D

FIGURE
2

APPENDIX 3
Forms

City of Bristol, VA ISWMF
GEM 5000 Calibration Log

Date	Time	Fresh Air Reading (%)			Calibration Gas Used (%)			Calibration Results (%)		
		CH_4	CO_2	O_2	CH_4	CO_2	O_2	CH_4	CO_2	O_2

City of Bristol, VA ISWMF
MSA Alt-Air Multi-Meter Calibration Form

Date	Time	Span Gas Used				Zero Cal				Span Cal			
		Comb	O2	CO	Res	Comb	O2	CO	Res	Comb	O2	CO	Res

Bristol Quarry Landfill
Air Monitoring Form

Page _____

Sampling Date: _____ **Weather:** _____

Ambient Temperature (^{O}F): _____

Barometric Pressure (IN. WC): _____ **Monitored by:** _____

GEM Screening:

Sampling Location	Time	% CH_4	% LEL	% CO_2	% O_2	% Bal.

Bristol Quarry Landfill
Air Monitoring Form

Page _____

MSA Screening:

Sampling Location	Time	CO (ppm)	H_2S (ppm)

Bristol Quarry Landfill
Air Monitoring Form

Page _____

Summa Canister Grab Sampling:

Sampling Location	Can. ID#	Start Time	Initial Vacuum (in Hg)	End Vacuum (in Hg)	COC Completed

Comments:

APPENDIX 4
Calibration

9.0 Calibration

9.1 Calibration introduction

The GEM5000 gas analyzer is carefully calibrated at manufacture and when returned for service. However, it is sometimes desirable to be able to carry out a calibration process between services.

This section outlines the correct procedures to enable the site engineer to field calibrate the gas analyzer.

✍ Note: This does not replace the factory service and calibration. If this calibration is completed incorrectly it may decrease the accuracy of the gas analyzer.

CH_4, CO_2 and O_2 can be measured by GEM5000 gas analyzer as standard; these channels can be user calibrated. The analyzers have other gas channel options that are specified at manufacture; these too can be calibrated. This section will describe in detail how to calibrate the three standard gas channels plus the CO channel.

The GEM5000 instrument can have a H_2 compensated CO channel. This option requires that H_2 is used in the calibration process and is also set out within this section.

For the other gas channel options contact QED for advice.

Two important terms that are used within this section are 'Zero' and 'Span'.

Zero: The point at which the gas analyzer is calibrated when there is none of the target gases present.

Span: The point at which the gas analyzer is calibrated when a known quantity of the target gas is present.

9.2 Frequency of calibration – best practice

The GEM5000 gas analyzers can be checked against a known concentration of gas, to give confidence that the analyzer is operating as expected at the time and conditions in which it is being used.

It is recommended that the instrument is regularly serviced and calibrated by QED in accordance with the due date on the instrument.

When defining the frequency of user calibration, the following are factors to be considered:

- The frequency of use of the analyzer. (daily?/monthly?)
- The level of confidence and accuracy required for readings to be taken.
- Historical user calibration data.
- Site specific requirements or conditions.
- Historical understanding of expected readings on site.

Zeroing of the gas analyzer should be undertaken at the start of each day's monitoring.

Use historical data to drive your frequency of calibration.
If there is no historical data a good starting point for a daily monitoring round is performing a calibration once every week or every other week.

The results of the calibrations will need to be recorded to monitor over time whether the frequency of calibration needs to be increased or decreased relative to the confidence required.

The confidence required will be driven by the site specific / user requirements.

When undertaking the monitoring with an understanding of the history of the gas levels of that site, a calibration check could be triggered if the readings measured are different to what is expected.

✍ Note: For assistance please contact Technical Support at (800) 968-2026 or email landtec_support@qedenv.com

9.3 Calibration gases

User calibration of a gas analyzer will greatly improve the data accuracy in the range of the calibration gases used. This may cause less accurate readings of concentrations outside this calibrated range. Users should select the correct calibration gas for the expected gas levels on their particular application.

- To improve calibration at lower levels requires the use of gas mixtures 1 and 2.
- To improve higher levels use gas mixture 3.
- For standard CO only 100ppm CO gas is needed.
- For CO (H_2 compensated) both CO 100ppm and H_2 1000ppm gases are needed.

The following table indicates the different gas mixture canisters used for calibration:

Calibration gas	**CH_4**	**CO_2**	**O_2**
Mixture 1	5%	5%	6%
Mixture 2	5%	10%	0%
Mixture 3	60%	40%	0%

Calibration targets for gas cells are dependent on the gas/range and type of cell fitted. Contact Technical Support for assistance.

These are for general use but other gas concentrations can be used.

✍ Note: The above gases and most other gas concentrations can be supplied by QED. For further information please contact Sales at (800) 624-2026 or email info@qedenv.com

⚠ **Warning**	Calibration gases can be dangerous. For each gas used the appropriate material safety data sheet must be read and understood before proceeding.

9.4 Calibration set-up

⚠ **Warning**	Do NOT attach the gas supply to the gas analyzer before putting the analyzer into the 'Gas Check' screen. Select 'Check Spans' from the 'Operation Settings' menu.

The regulator supplied with the calibration kit has been configured to deliver a fixed flow.

As the regulator's flow is factory set, it only requires a few turns to open, no adjustment is necessary.

⚠ **Warning**	**Exhaust port** When the gas analyzer is being calibrated, there are two possible exits for the gas, via the usual manner out of the exhaust (yellow) port of the analyzer or in cases of over-pressurisation the 1/16″ port on the red pressure relief valve located on the regulator. It is recommended that both ports have exhaust tubing attached. The exhaust tubing must emerge in a well-ventilated area. Ensure there are no leaks in the tubing and connections. The calibration of the gas analyzer should be carried out in a safe area with all necessary precautions taken when using potentially dangerous, explosive or toxic gases.

✍ Note: There is also potential for gas to expel from the internal flow (blue) port of the gas analyzer (applies to the GA5000 only).

9.5 Calibration equipment

The diagram below displays the regulator and tubing equipment for user calibration:

- Certified calibration gas, available in either 29 liter, 34 liter or 58 liter gas canisters are supplied with the Landtec calibration kit. Please refer to the Landtec website www.landtecna.com for further information.
- The regulator supplied with the calibration kit is pre-set for flow and pressure rates that are factory set.
- If you are using a non Landtec supplied regulator, please ensure that it does not supply any greater than 200 mbar pressure.

9.6 Gas analyzer

For the GEM5000 gas analyzer the calibration options can be found by selecting the 'Menu' key followed by soft-key 'Operation Settings'. Select 'Key 2 – Gas Check' then follow the instructions on the analyzer screen by selecting 'Key 2 – Gas Check'.

9.7 Calibration processes – best practice

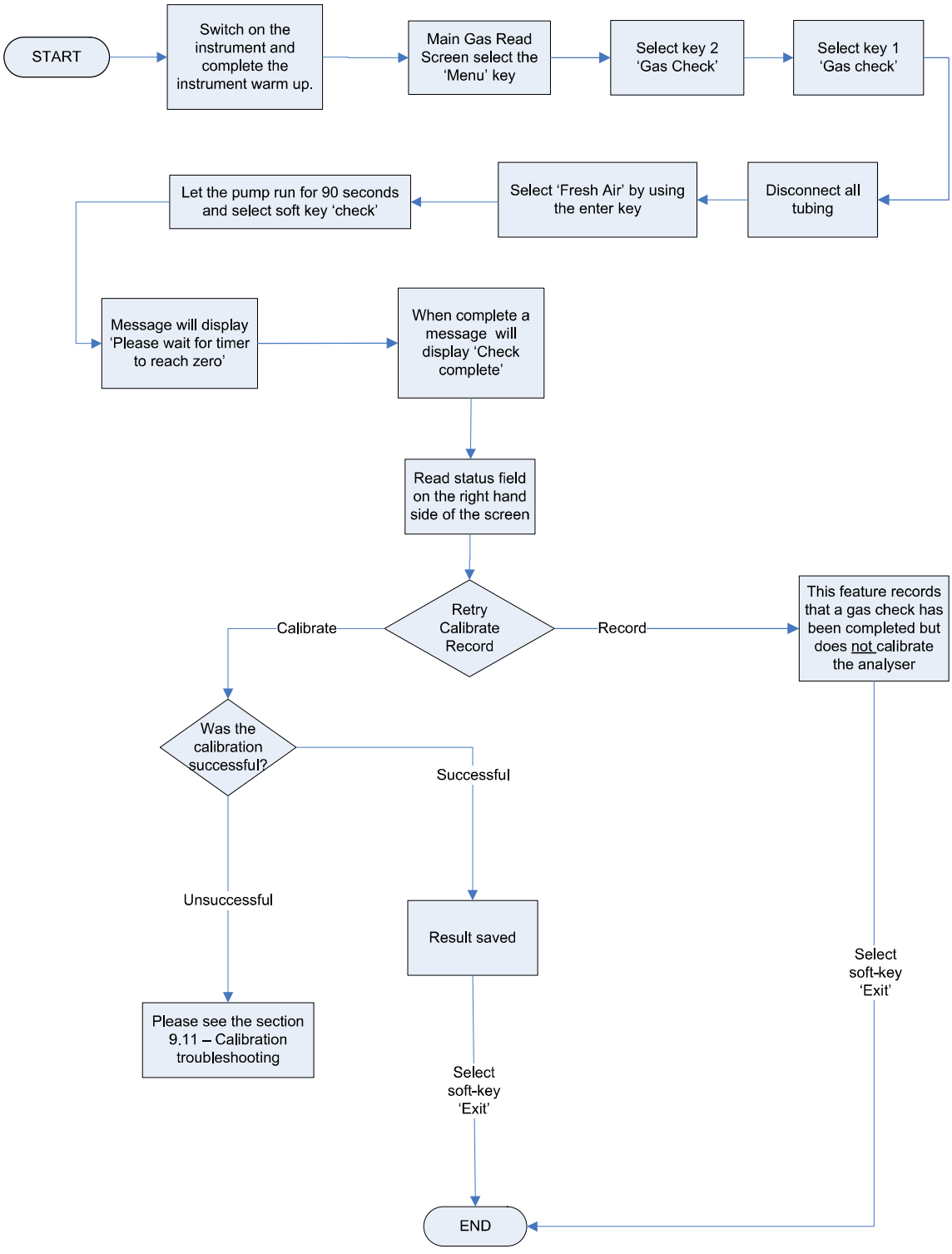
The following process diagrams outline the calibration steps.

- Ensure that you are regulating calibration gas down to below 200 mbar pressure, if you're not using a Landtec regulator. The use of a pressure relief valve is also highly recommended.

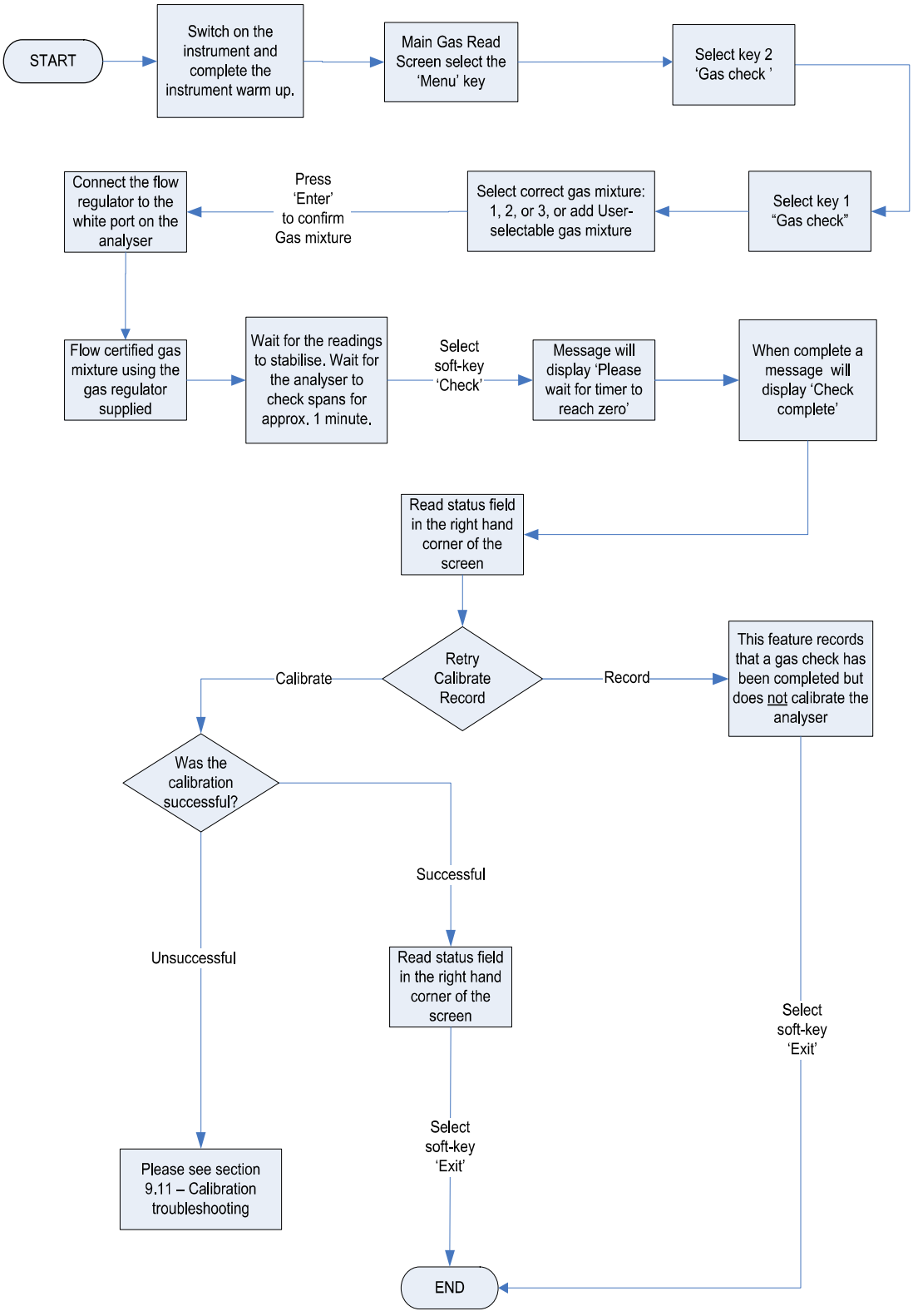
- When calibrating, it is recommended to use a calibration mixture close to the levels you are trying to measure, i.e. if you are trying to measure gas migration on a closed landfill, we'd recommend calibrating with CH4 5%/CO2 5%.

- In regards to frequency, we would recommend that you perform a fresh air calibration before each monitoring session, and a span calibration typical every 4 – 6 weeks.

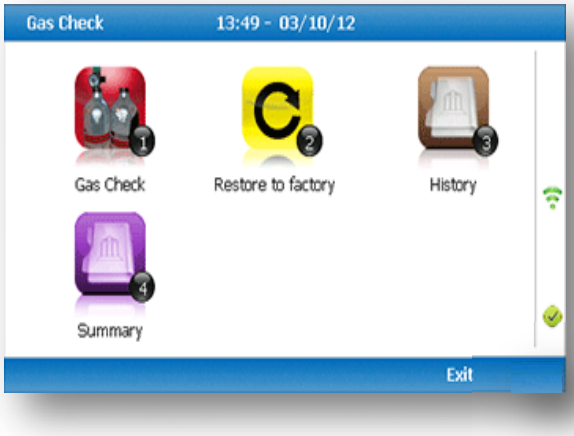
9.7.1 Gas Check in fresh air



9.7.2 Calibration – mixtures 1, 2, & 3



9.8 Restore to factory settings



This option will reset the gas analyzer to all of its factory programmed calibration settings and will clear ALL the user defined calibration points. It will not affect or remove ID's or readings from the analyzer.

1) Select 'Key 2 - Restore to factory' followed by the soft-key 'Confirm' or 'Cancel'.

2) A validation message is displayed 'Reset user calibration?' Press the soft-key 'Confirm' to continue with the factory settings or soft-key 'Cancel' to cancel the operation and return to the Gas Check menu.

9.9 Calibration history

The GEM5000 gas analyzer logs user calibrations in 'History' application. This can be used as an aid to ensuring that gas measurements are valid and accurate. Both good and failed calibration results are recorded for each channel calibrated.

1) Select 'Key 3 – History'.

2) The operator may view the calibration data stored. Use the soft-key 'Filter' to add a sort filter to the history enquiry.

9.10 Calibration summary

The GEM5000 gas analyzer has the facility to log the history of user calibrations.

1) Select 'Key 4 – Summary'.

2) The operator may view the calibration data history stored by ID, technician, timestamp, type and calibration result. Use the soft-key 'Exit' to exit and return to the 'Gas Check' menu.

3.9 Calibration

The ALTAIR 4X can be calibrated manually using this procedure or automatically using the Galaxy Test Stand. Refer to 7.7 of the Appendix. Calibration must be performed using a flow regulator with a flow rate set to 0.25 liters per minute.

If a battery charging cycle is interrupted before it is completed (4 hours for a fully discharged battery), allow the instrument's internal temperature to stabilize for 30 minutes before performing a Calibration.

NOTE: The Galaxy Test Stand is not a CSA certified calibration method.

3.9.1 Fresh Air Setup and Zero Calibration

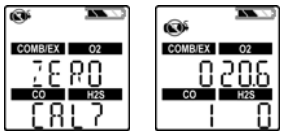
To skip the ZERO procedure and move directly to the calibration span procedure, push the ▲ button. If no button is pushed for 30 seconds, the instrument prompts user to perform a SPAN calibration before returning to the Normal Operation mode.

1. Press and hold the ▲ button in Normal Operation mode for three seconds.
2. If calibration lockout option is selected, enter password.

- ZERO screen displays.

If calibration lockout option is NOT selected:

- ZERO screen displays.



3. With the instrument exposed to fresh air, press the ⏻ button to confirm the ZERO screen. A sensor Refresh and Zero Calibration now occur.

   NOTE: Alternatively, press the ▼ button to execute a Fresh Air setup (FAS). See section 3.2.2 for more details.

- After ZERO calibration completes, the instrument momentarily displays “ZERO PASS” or “ZERO ERR” along with the flag of any sensor that failed.

   NOTE: During instrument zero calibration, the oxygen sensor is also span calibrated to 20.8% oxygen fresh air, adjusting the calibration curve as needed. During instrument span calibration, the O_2 sensor’s accuracy is checked against a known oxygen gas concentration without adjusting the calibration curve.

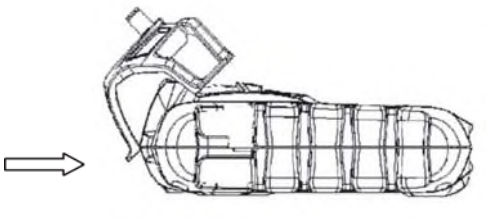
3.9.2 Span Calibration

To skip the Span procedure, push the ▲ button.

If no button is pushed for 30 seconds, the instrument returns to the Measuring mode.

1. Once the zero is set, the span screen displays.
2. Connect the appropriate calibration gas to the instrument.

3. Attach the calibration cap to the instrument.
   - Insert tab on calibration cap into slot on instrument.
   - Press calibration cap as shown until it seats onto instrument.



- Press both side tabs down onto instrument until they snap in.

- Ensure that the calibration cap is properly seated.
  - Connect one end of the tubing to the calibration cap.
  - Connect other end of tubing to the cylinder regulator (supplied in the calibration kit).
4. Open the valve on the regulator.
5. Press the ⏻ button to calibrate (span) the instrument.
   - LEDs flash
   - SPAN calibration starts.

After the SPAN calibration completes, the instrument momentarily displays "SPAN PASS" successfully.

If a sensor is nearing its end of life, this"SPAN PASS" indication is followed by the end of sensor life warning (❤). The ❤ icon, and gas type of the sensor nearing end of life, blink for 15 seconds when the instrument returns to Measure mode. When in Measure mode, the heart icon is continuously displayed.

If the span calibration is unsuccessful:

- a Sensor Life Indicator displays (⚠ and ❤) to show the sensor has reached its end of life and should be replaced
- The unit remains in alarm state until the ▲ button is pressed
- The ⚠ and ❤ symbols remain on the display until a successful calibration or the sensor in question is replaced.

NOTE: A span calibration can fail for many reasons other than a sensor at the end of its life. If a span calibration failure occurs, verify items such as remaining gas in the calibration cylinder, gas expiration date, security of the calibration cap, etc. and repeat calibration prior to replacing the sensor.

3.9.3 Finishing Calibration

1. Close the valve on the regulator.
2. Remove the calibration cap.

The calibration procedure adjusts the span value for any sensor that passes the calibration test; sensors that fail calibration are left unchanged. Since residual gas may be present, the instrument may briefly go into an exposure alarm after the calibration sequence is completed.

7.7 Calibrations